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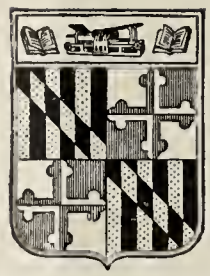
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JOHN JAMES WEPFER, A RENAISSANCE STUDENT OF APOPLEXY.[1]

By John E. Donley, M. D., Providence, R. I.

A man who does not know what has been thought by those who have gone before him is sure to set an undue value upon his own ideas.—*Mark Pattison, Memoirs, 78.*

In that pleasing volume, Renaissance Types, Mr. W. S. Lilly remarks: "I remember one of the most accomplished scholars it has been my good fortune to meet saying, that in investigating the past the problem is to extract general history from individual histories; or to quote his own words, 'zu finden die allgemeine Geschichte in Einzeldarstellungen.' I think that is profoundly true. History has been called the essence of innumerable biographies. The vast majority of them, of course, tell the same monotonous tale. But in the lives of great men the spirit of the age in which they worked is, in some sort, incarnate and so may be most fruitfully studied. Cicero, in a well-known passage, speaks of them as luminaries in the world's career. So they are. And they radiate light on their times. They see by the illumination of genius which is in them; and in their light we may see light." These words of the accomplished author written by him of history in general, I would apply to the lives and writings of great physicians; for in its own special way the history of medicine, relating, as it does, a part of the story of the organic life of humanity, is quite as expressive of the moral, intellectual and, I had almost said, even religious life of an age or of a people, as are its cathedrals, its paintings, its sculpture, its poetry or its political institutions. Each of these partially and all of them in greater degree do but mirror forth in visible expression the collective consciousness that produced them. And hence it is only when we study illustrious physicians as types, living and working and striving, sometimes succeeding, many times failing, in the actual world of their own time and place, that we are enabled to breathe their contemporary spirit, and to catch, in some fashion, the collective medical mind in its manywise complex and most characteristic expression.

If as someone has so aptly said, the thirteenth century was the Maytime of politics, religion and the arts of life, certainly the seventeenth century was the Maytime of science and of medicine. Vigorous, enthusiastic, conscious, sometimes perhaps too conscious of its new-found strength and freedom, it set about its work of destruction and reconstruction with the gay, lightheartedness of youth. It was indeed a Renaissance. But free as it was in spirit, it still paid tribute to its dead masters in the years that had gone before. And not anywhere more intensely than in this seventeenth century may we observe the fierce antagonism of opposing principles and tendencies. Here is the principle of tradition and outward authority contending with the spirit of free inquiry born of the Renaissance; here are prejudice, habit, superstition even, going hand in hand with scientific experimentation; here again, the conjectures of one man rapidly become the conclusions of the next

[1] Read before the Johns Hopkins Hospital Historical Club of Baltimore, October 12, 1908.

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and are made the axioms of the third. From the second to the ninth decade of this fruitful period lived John James Wepfer, one of the most illustrious physicians of his time, a man whose eyes were the eyes of Vesalius, whose spirit was the spirit of Harvey, but upon whose imagination the bright images were etched by the pale ghost of Galen.

The seventeenth century I have ventured to call the May-time of science and of medicine, for such in truth it was. And what a burst of genius was here! Let us try to appreciate the general characteristics of this marvellous era of the Renaissance, devoted to "good learning," as Erasmus says, when modern man re-discovering his humanity, and becoming self-conscious of his latent capabilities, sowed that seed from which we have reaped a most luxuriant harvest. The long period of the Middle Ages, those ages shot through and through with burning faith and filled with prophetic intimations of the life to come, was drawing to its close; the ideas and ideals which had long occupied the minds and inspired the actions of men, were losing somewhat of their oldtime appeal and vigor. Then Constantinople fell. Suddenly Europe was brought into communion with the reincarnated civilization of ancient Greece. Scholasticism, that wonderfully compact, ingenious and necessarily rigid system of theology and philosophy, the intellectual embodiment of medieval man's conception of his relations to God, to nature and to his fellowman, no longer sufficed as the chief and adequate expression of human faith and knowledge. Consequent upon the enthusiastic study and imitation of the philosophy, the literature, the art and the science of Greece, which had its inception among the scholars of fifteenth century Italy, came a liberation of the Greek spirit of free criticism, a desire for natural knowledge and a diffusion of Greek modes of thought. What had most deeply influenced the mind and stamped the civilization of the Middle Ages was its supernaturalism, its mystic, wistful otherworldiness. We behold it raising the walls of Notre Dame and Cologne, of Durham and Lincoln, of St. Mark's and St. Peter's; it inspired the chisel of Michael Angelo and the brush of Raphael; like some sweet perfume it exhales from the works of Albertus Magnus, Thomas Aquinas and Bonaventura, not less than from those of à Kempis and St. Teresa. The same religious spirit was not uncommon in the medical works of the time, for Wepfer himself writes as the last sentence of his treatise on apoplexy the words, *Soli Deo Gloria.* In the hierarchy of medieval learning theology was Queen, *Regina scientiarum,* and the other sciences were her handmaids, *Ancillæ theologiæ.*

On the other hand the dominant characteristic of the Renaissance was its naturalism, its all pervasive worldliness and its Hellenic individualism. A passionate, irrepressible yearning for freedom, an intense desire to escape the restraints of outward authority, a longing for what seemed to them rightly or wrongly a fuller, larger, richer life actuated the best of these men; such men as Desiderius Erasmus, Johann Reuchlin, Thomas Linacre and Sir Thomas More. The voice of tradition, sometimes so harsh and insistent in medieval times, no longer dictated to their pen; or spake to them only in whisper; as their motto they adopted if not literally, at least in practice, the *homo mensura* principle of Protagoras; and from speculation upon a life to come they turned their glad eyes to the life and the world of Nature about them, and discovered there as Shelley did in after years, a "wilderness of harmony."

Such was the spirit abroad in the world of learning when Wepfer began his work; for the Renaissance in any just conception of it, should be looked upon as a spirit, a tendency, a movement rather than as a body of systematic doctrines and beliefs. But however far-reaching the influence of Hellenism, it would be an error to think of it as immediately supplanting the older habits of thought. Men do not and should not, easily relinquish the heritage of centuries, and in an age of transition, old and new, true and false, fact and phantasy are to be found inextricably blended together. A curious example of this in the popular medicine of the time, is Nicholas Culpeper's *Complete Herbal,* written "from my house in Spitalfields next the Red Lion, September 5th, 1653," five years before the publication of Wepfer's *de Apoplexia.* "He that would know the operation of the herbs must look up to the stars astrologically," says this master; and so to him briony is "a furious martial plant," and brank ursine "an excellent plant under the dominion of the moon." Of rosemary he says, "the sun claims privilege in it, and it is under the celestial ram," and of viper's bugloss, "it is a most gallant herb of the sun." (*Apologia Diffidentis,* W. Compton Leith, London, 1908.)

In the universities the Galenists still held their own against the innovators, and hurled their verbal thunderbolts at the instigators of novelty, who were branded as traitors in the medical camp. At the great University of Paris, taught the fiery old Galenist Riolan, who vehemently declared that he would rather be wrong with Galen than right with Paracelsus. There too was John Riolan, his son (to whom Wepfer devotes much attention), Dean of the University, Professor of Anatomy and First Physician to the Queen Mother, Marie de Medicis, who preferred the old way in place of Harvey's and whose purpose in life was "to keep the physic of Galen in good repair"; and after Riolan, the son, came his friend and admirer Gui Patin, the genial writer of letters who undertook in his lectures not only to expound Galen but also to answer all questions and to solve all difficulties. That the older philosophy was by no means dead may be further understood from the fact that in 1614, six years before the birth of Wepfer and two years before Harvey's demonstration at the College of Physicians, the famous Jesuit Suarez, the last of the great scholastics, had published at Geneva his two-volume *Disputationes Metaphysicæ.* This work was quite generally used as a text-book in the seventeenth century, during which the pioneers of modern philosophy grew to maturity. It contained all the complexities and subtleties of scholasticism, and may perhaps have contributed to the scholastic elements in Descartes and Spinoza.

At Montpellier the ancient traditions were still in vogue. In Lord King's Life of John Locke,[2] is given an account of the annual "capping" at this famous seat of learning. Locke writes in his diary: "The manner of making a Doctor of

[2] Quoted by John Brown, M. D., *Horæ Subsecivæ,* p. 15.



JOH. JACOBI WEPFERI
Medicinæ Doctoris

OBSERVATIONES ANATOMICÆ,

EX

Cadaveribus eorum, quos
sustulit

APOPLEXIA.

Cum Exercitatione

DE EIUS LOCO AFFECTO.

SCHAFFHUSII.

Typis JOH. CASPARI SUTERI
MDC LVIII.

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Physic is this: first, a procession of scarlet robes and black caps—the professor took his seat—and after a company of fiddlers had played a certain time, he made them a sign to hold, that he might have an opportunity to entertain the company, which he did with a speech against *innovations*—the musicians then took their turn. The inceptor or candidate then began his speech, wherein I found little edification, being chiefly complimentary to the chancellor and professors who were present."

These must indeed have been anxious days for the old doctors. What with Molière holding their diaphanous pedantry up to ridicule and the younger generation of physicians deserting the primrose path of speculation, lined now with the white bones of dead theories, and entering instead the great workshop of Nature, the ancient sons of Aesculapius must have felt their influence and their dignity fading into a sad and sorry thing. The new spirit spoke in no uncertain terms. "Medicine," says Lord Bacon, "is a science which hath been more professed than labored, more labored than advanced, the labor being in my judgment more in a circle than in progression: I find much iteration but small addition." And in the same tone Dr. John Locke, writing to his friend the famous Irish physician, Sir Thomas Molyneux, speaks of the medicine of his time as follows: "I perfectly agree with you concerning general theories—the curse of the time, and destructive not less of life than of science—they are for the most part but a sort of waking dream, with which, when men have warmed their heads, they pass into unquestionable truths. *This is beginning at the wrong end,* men laying the foundation in their own fancies, and then suiting the phenomena of diseases and the cure of them, to these fancies. I wonder, after the pattern Dr. Sydenham has set of a better way, men should return again to this romance way of physic. But I see it is more easy and more natural for men *to build castles in the air of their own, than to survey well those that are on the ground. Nicely to observe the history of diseases in all their changes and circumstances is a work of time, accurateness, attention and judgment,* and wherein, if men through prepossession or oscitancy, mistake, they may be convinced of their error by unerring nature and matter of fact. What we know of the works of nature, especially in the constitution of health and the operations of our own bodies, *is only by the sensible effects, but not by any certainty we can have of the tools she uses or the ways she works by.*" (Quoted by John Brown, M. D., *Horæ Subsecivæ,* p. 21.)

Observation, the patient study of nature, was to be then the watch-word of the new philosophy, the philosophy of Wepfer, Harvey, Galileo, Vesalius, Locke, Sydenham, Descartes, Borelli, Hooke, Van Helmont, Boyle, Mayow, Malpighi, Swammerdam and the Royal Society of England, founded with the hope that it would help its members in their "attempts by actual experience to shape out a new philosophy or to perfect the old." And here one may appropriately borrow the words of Walter Pater, spoken of an older school of learning: "To that school the young man would come, eager for truth, expecting much from philosophy, in no ignoble curiosity, aspiring after nothing less than an 'initiation.' He would be sent back sooner or later, to experience, to the world of concrete impressions, to things as they may be seen, heard, felt by him; but with a wonderful machinery of observation, and free from the tyranny of mere theories." (Marius, the Epicurean, p. 128.)

In concluding this brief and altogether too imperfect sketch of the general spirit of Renaissance medicine in the seventeenth century, I hope I may digress for a moment to point out the interesting analogy which it seems to me may be drawn between the medicine of this period and that of Greece in the era of Hippocrates. This analogy while, perhaps, not obvious at once becomes apparent if we look beneath the surface of things, for in each there was a period of speculation which by its very absurdities and extravagances led to an inevitable reaction and a return to a healthier mode of thought, while in each instance again this reaction was determined, either directly or indirectly, by the teaching of the physicians of Cos. In the years preceding the Hippocratic period, it had been the school of Cnidus which occupied the position of pre-eminence in the medical thought of Greece; and this school inspired by the doctrines of Heraclitus, Anaxagoras and Empedocles, had come under the influence of that nature-philosophy which led it astray, and which by enervating much of its fundamental thinking, ultimately prepared its downfall. The Cnidian school represented an attempt to build medicine upon a basis of cosmology, an attempt which then, and ever since, was foredoomed to failure. In the consummation of this effort hypothesis was added to hypothesis, analogy to analogy, speculation to speculation, until the whole stood like a pyramid resting upon its apex. Such very excesses of imagination could not but produce a reaction, the instigation of which, shall ever redound to the honor of the School of Cos. Taking their stand upon the firm ground of observation and experience, the Hippocratic physicians divorced medicine from the airy phantasies of the prevailing nature-philosophy, as well as from a misleading supernaturalism, and by their patient, acute study of phenomena, cleared the path along which all time science has travelled in the Western world.

It is not difficult to trace a similar evolution in the medicine of the seventeenth century Renaissance. The philosophical dialectic, and Oriental pseudo-mysticism of many medieval physicians, like the nature-philosophy of Cnidus, had enticed medicine, far, very far beyond its legitimate province.[3] The bubble was just about to burst, when by the fortunate progress of human events, the physicians of the Renaissance were brought into immediate possession of the writings and hence of the method of the *corpus Hippocraticum.* Once more they returned to the ways of their ancient masters. By building their hypotheses upon the data of sense, they gathered up again the broken strands of Hellenic thought, and wove them as the first

[3] I do not, of course, forget that during the Middle Ages, such men as William of Salicet, Lanfranc, Mondino, Taddeo and Gui de Chauliac, following the Greek tradition, did much to advance anatomy and practical surgery.

threads into the marvellous fabric of modern science. To them as to the Greeks was given the "teeming wealth of constructive imagination united with the sleepless critical spirit which shrank from no test of audacity; there was the most powerful impulse to generalization coupled with the sharpest faculty for descrying and distinguishing the finest shades of phenomenal peculiarity." (Gomperz, Greek Thinkers, Vol. I, p. 276.) And if, as was bound to happen, their generalizations were oftentimes erroneous, such errors could be, as indeed they have been, corrected by an appeal to the visible record upon the open scroll of Nature.

John James Wepfer, son of George Michael Wepfer, Councillor of the Canton, was born December 23, 1620, at Schaffhausen, which in after years became the birthplace of Johann von Müller, the historian of Switzerland. Schaffhausen, an ancient town, quaintly and irregularly built, is situated upon an eminence overlooking the Rhine, twenty-four miles north of Zürich. Among other historic buildings it contains a massive basilica (1052) in which is the bell that inspired Schiller's "Song of the Bell," and Longfellow's "Golden Legend." At the time of Wepfer's birth Descartes was twenty-four and had as yet published nothing; twenty years had passed since the cruel burning of Giordano Bruno at Rome; Galileo was fifty-six and ten years previous had made his most remarkable discovery, that of Jupiter's satellites, January 7, 1610. In the very year of Wepfer's birth Francis Bacon gave to the world his *Novum Organum;* while two years were yet to pass before the birth of Molière (1622) and eight before the publication of Harvey's *Exercitatio* (1628). During eight years Wepfer studied the humanities and medicine at Bâle and at Strasburg, and then, like other youths of his time, spent two years in the universities of Italy, that Italy to which Linacre, from his altar upon the mountain top of Cevennes addressed those fine words: "*Hoc tibi mater studiorum, ô sancta meorum, templum Linacrus dedicat, Italia.*" Returning from Italy, where his young mind must have been fired with a love of learning, Wepfer took his Doctor's degree at Bâle in 1647, just ten years after Descartes had published his "Philosophical Essays" containing the Discourse Upon Method. The magistrates of his native town were not slow to appreciate that in Wepfer they possessed a brilliant young man; accordingly in November of 1647, they appointed him physician to the city; and what had hitherto been most unusual, they conferred upon him the privilege of performing post-mortem examinations. With such diligence and success did Wepfer pursue the duties of his profession that ere long his name was heralded far beyond his native Schaffhausen. In 1675 he was appointed physician to the Duke of Wirtemberg and shortly afterward to the Marquis de Dourlach and to Charles, the Elector Palatine. Like his famous predecessor in the sixteenth century, Ambroise Paré and other illustrious physicians in those troublous times, Wepfer served as an army surgeon; and the care which he bestowed upon the Duke of Wirtemberg as well as upon the soldiers of the army which this Prince commanded seriously undermined his health. Although a septuagenarian he gave his service freely and constantly to the service of the army of the Emperor Leopold, which was being daily decimated by the ravages of an epidemic fever. In this work he became a victim to his own zeal and succumbed to the illness for which age, overwork and fatigue had prepared him. He died January 28, 1695, in his library, surrounded by the books which in life he had loved so well. At his own request an autopsy was performed and it was then discovered that there was calcification of the aorta, which he himself had conjectured.

Concerning the daily life and habits of Wepfer we possess some information.[4] He rarely retired before eleven and usually arose about four in the morning. Sunrise found him in his study, where he devoted the first part of the day to prayer and to the reading of the sacred scriptures, both in the Greek and the Latin tongue. The rest of the day he devoted to the Muses with such assiduity and zeal that he was never idle; even at his meals he was busy with some book or with his correspondence. An intense desire for knowledge filled him and so great indeed was this desire that when the opportunity was lacking for investigating human bodies, he devoted his leisure time to the study of the lower animals, his observations upon which he reported frequently to his medical brethren.

In his diet Wepfer was most frugal. Of food and drink he took only so much as he thought necessary to refresh his energy; and even at the tables of princes he refused those things which he considered injurious. Wine he drank only with his food, and even then he desired that it be diluted with water, so that thus by his example he might show to others how potent is temperance in the conservation of vigorous health.

Beside his treatise upon apoplexy Wepfer was the author of several other valuable works characterized by scientific insight, wide knowledge and careful observation. The excellent researches which he published in 1679 upon the effects of hemlock and other poisons,[5] contributed not a little to the support of the doctrine of vital force in the heart; for these researches showed that in animals killed with nux vomica or other poisons, the blood exhibited not the least trace of alteration, but that the fibres of the heart were shrunken and the structure of the viscera changed. Wepfer further demonstrated that the heart devoid of blood could be kept in motion for some moments after death by the action of certain substances. His contributions to pathological anatomy are valuable, while to comparative anatomy he added many exact descriptions, such as those of the structure of the wolf and the eagle, based upon the careful dissections which he had made.

But for us his most interesting work is the *de Apoplexia,* a small volume of 304 pages, published at Schaffhausen in 1658; reprinted at the same place in 1675, and at Amsterdam in 1681, 1710, and 1724. Although well known upon the Continent, these admirable observations seem to have been little read in England; for as Dr. Norman Moore tells us[6] they are

[4] From the Memorial Address contained in Wepfer's "*Observationes de Affectibus Capitis,*" 1745.

[5] *Circutæ aquaticæ historia et noxæ,* Bâle, 1679.

[6] Medicine in the British Isles, Oxford, Clarendon Press, 1908, p. 123.

not mentioned in the controversies which arose about the attack of apoplexy which was the beginning of the fatal illness of King Charles *II,* nor is there the least allusion to them in the *Cerebri anatome* of Willis, published in 1664.

Wepfer's preface discloses admirably the spirit with which he approached his work. Therein he writes as follows[7]: That the lacteal veins, the circulation of the blood, the chyliferous ducts, the lymphatic vessels and the other discoveries of this age have aroused not a little disturbance in pathology, is well known to those who, brought up upon the ancient dogmas, have learned the new things as well. For concerning the use and activities of many parts the views hitherto entertained must of necessity be altered, and not a few of them changed, amended or explained in an altogether different fashion. With many persons, however, assent is obtained with difficulty, and from those particularly, who from childhood have been imbued with other and diverse opinions. Now since solid and substantial arguments and the testimony of the senses are alone able to convince I have for several years, after I had learned of the circulation of the blood, opened many human bodies, both alone and with the assistance of my illustrious and learned colleagues Christopher Harder, Frederick Screta, and Emmanuel Hurter. Accordingly in the course of some years I have collected many histories of apoplexy, lethargy, mania, ulcer of the throat, pleurisy, phthisis, palpitation of the heart, hectic fever, hydrops of the chest, very great distention of the stomach, ulcer of the same, dysentery, wounds of the intestine, ascites and anasarca, enlarged spleen, ulcerated kidney, abscess of the mesentery, calculus of the bladder, rupture of the same, hydrops of the uterus, difficult birth, rupture of an intestinal hernia, and various other diseases. I shall give here the histories of four cases of apoplexy, to which I have added a dissertation concerning the place affected in this disease. Incidentally I have set forth the proximate causes of the same, and to the best of my ability have accommodated all to the laws of the circular motion of the blood. Wepfer then goes on to say that if he has fallen into errors, and his errors are pointed out to him he will gladly correct them; and that if the histories of apoplexy which he has given meet with the approval of his readers, he will add still other histories later on, accompanying each with a brief explanation. Among these promised histories may be mentioned particularly that of a young girl without a brain and that of an enlarged spleen, observed some years before.

In his four case histories the author gives an account of as many apoplectic attacks, upon the victims of which he had the opportunity of performing autopsies. The ages of these patients were respectively, 45, 70, 60, and 50 years, and in each of them a cerebral hemorrhage was found. Having completed the histories and the account of the post-mortem findings in his cases, Wepfer proceeds to the main thesis of his book, the *Exercitatio Medica de Loco Affecto in Apoplexia,*[8] which I desire briefly to summarize.

We have said that Wepfer had the eyes of Vesalius and that the bright images upon his imagination were etched by the pale ghost of Galen. As an example of the first characteristic we may point to his constant appeal to the testimony of the senses; and to illustrate the second, we may refer to the unquestioning faith with which he accepts the ancient theory of the animal spirits around which so many controversies have been waged in the history of medicine. John Riolan, the son, of Paris, "defender of lost causes," as Wepfer calls him, is the man against whose opinions our author directs a great part of his dissertation. Riolan taught after Galen, that in man, the internal carotid arteries having entered the skull, immediately divided outside the dura into a number of small communicating branches, and formed thereby the so-called "rete mirabile," from which the vital spirits distilled into the ventricles of the brain, where they were transformed into animal spirits and whence they were carried by the nerves to the various parts of the body. Both of these opinions Wepfer denies and to substantiate his assertions he carries Riolan to the direct evidence afforded by anatomy. Neither Riolan, he says, nor anyone else has seen or will ever see in man, this rete mirabile formed from the interlacing branches of the internal carotid arteries and lying beneath the dura mater at the sides of the sphenoid bone. For in order to demonstrate the existence of parts that are visible and tangible, nothing short of the solid testimony of the eyes and the hands must be sought; and to this testimony alone should belief be given. Accordingly, if with industry and caution you look for this supposed rete you will find that each internal carotid artery proceeds intact and not divided, along the sides of the sphenoid bone and the pituitary gland; furthermore that it perforates the dura mater intact, and then, having divided into its several branches, permeates the different parts of the brain with its vivifying nourishment, not even a drop of which reaches the dura mater. This have I observed not once nor in one head, but as often as I have sought for the much talked of rete mirabile, a thing I have done many times.

In two ways I have investigated the course of this artery. First, having incised the dura mater and divided the artery I introduced a stylus into it at the point where it perforates the dura mater, and with what care I could, I followed the artery from the pituitary gland to its canal in the bone. In other cases I followed the carotid artery to the styloid process and observed that here it bends and having entered the canal in the petrous bone proceeds obliquely forward; accordingly with whatever dexterity I was capable, removing the flesh and membranes, I excised the bony canal for about an inch of its length, diligently watching lest I should injure the artery. Having emerged from the canal the artery ascends, turning a little posteriorly, then bending again descends by the pituitary

[7] In the quotations from Wepfer, I have, for the sake of brevity, paraphrased rather than translated literally the words of the text.

[8] By "apoplexy" Wepfer means not merely hemiplegia, but any attack characterized by generalized loss of sensation and movement.

gland; once again it aseends and having been eovered by and held in the deep and conspicuous sinus beneath the anterior apophysis of the ephippium, turns upward and perforates the dura mater near the infundibulum. Throughout this whole course it remains intaet; nor have I observed any branch given off by it to the neighboring parts. How far this course of the internal carotid artery differs from the rete mirabile of Galen, the impartial reader may judge by comparing the descriptions of both.

When he has demonstrated anatomically the eourse of the internal carotid artery, Wepfer concludes that since it is plainly obvious that in man the rete mirabile is non-existent and merely a fiction, no arteries derived from it pass to the dura mater. It is true enough that many arteries are distributed to the dura mater, both anteriorly and posteriorly, but these are derived from the external carotid, which also supplies the face, the eyes, the fauces and the back part of the head. Thus Wepfer flatly disproves what Riolan had written, that from the retc mirabile were given off innumerable branches coursing in the dura mater, and serving as channels to convey the blood upward to the meningeal sinuses.

Furthermore, continues Wepfer, Riolan ought to have indicated precisely the manner in which the arteries of the dura mater arrive at the sinuses, since Fallopius declares that no arteries of the dura mater pass to the latter, and furthermore that this is so obvious that not even a word ought to be said regarding it. But that this is not so obvious to the senses I shall point out in the proper place. In the meantime I shall show in what manner the blood in the artcries of the dura mater reaches the third or longitudinal sinus. Each of these arteries laterally and anteriorly passes toward the corpus falciform, and having arrived at a point about a finger's breadth from it, it perforates the dura mater in several places and is united with the vessels which proceed from the sinuses of the dura mater and which are true veins; there it pours its blood into the latter and thus blood reaches the sinus. Therefore I, together with all those who favor the cireulation of the blood even in the brain, declare to Riolan that the arteries of the dura mater everywhere pour their own blood into its venous sinuses. Accordingly what will we have left over for the ventrieles? And how will he prove that they are the true storehouse of thc animal spirits? For all of the blood carried to this sinus naturally proceeds to the heart through the jugular veins, and not a drop of blood distills from them to the brain or to the ventricles; and moreover if this should occur it would result in the gravest injury to the individual.

In eontrast with this thoroughly scientific deseription of the cerebral vessels let us place Riolan's aceount of the same set of facts. From the rete mirabile, he writes, numerous arterial branches spread through the dura mater, and thus deposit the blood in the third or longitudinal sinus; from this sinus innumerable small tributaries are given off which spread out over the exterual cerebral eonvolutions and distill arterial blood, like dew, from above downwards. Furthermore, he adds that through the torcular, thc great vein of Galen, known also as the fourth sinus, carries blood and spirits to the ventricles of the brain. But in this deseription, aeeording to Wepfer, there are as many errors as there are words.

For what could be more absurd than that the blood leaving the vessels should penctrate tbe brain throughout its substance? For would not the blood by its very weight and in obedience to a constant law permeate to the base of the brain? Again, the blood distilling from above downwards and lying outside the vessels in the substanee of the brain, would in no way be able to re-enter these vessels, and the constant impulse of new blood in the arteries of the external convolutions would bring about a large aeeumulation, whenee most certainly suffocation and death would result. Or on the other hand the blood outside the vessels, resting quietly in the cerebral substance, would putrefy and set up an inflammation, which would cause a perpetual delirium. But these things are so absurd that no one save a delirious person would believe them.

Because of these and other objeetions to the theory of Riolan, Wepfer was eonstrained to postulate cireulation of the blood in the brain as well as in other parts of the body. And in pursuance of his purpose to find the exaet ehannels of this circulation he was led to make many disseetions of the cerebral vessels, for as he himself says, despite the eareful labors of distinguished men, like Veslingius, Thomas Bartholin, Highmore, Spigelius and many others, an ineomplete knowledge of the distribution of the cerebral vessels had hitherto rendered the eireulation of blood in the brain somewhat obseure.

With painstaking detail Wepfer deseribes his method of opening the cranium, and of removing the brain with its vessels. He then gives a truly admirable and clear deseription of the vessels of the dura mater, of the vertebral arteries and of the internal carotid arteries with their branches and their terminal ramifications eoursing in the pia mater and entering the substance of the brain. It is interesting to note that in this eonnection he deseribes aeeurately the arterial circular anastomosis whieh afterwards came to bear the name of Willis. Leaving the arteries he diseusses the venous sinuses and gives it as his opinion that the arteries of the dura mater as well as the internal carotids and vertebrals transmit their blood ultimately to the longitudinal sinus whenee it passes by way of the jugular veins baek to the heart. Wepfer summarizes his conclusions in the following words:

If the method of disseeting and of inquiry which I have indieated be observed, it will clearly appear that the carotid and vertebral arteries send a large number of braneheswithin the convolutions, where they meet and are joined with the descending tributaries of the third sinus, and this for no other purpose save that these descending tributaries may take up the blood in excess of that required for the nutrition of the brain and the generation of the animal spirits and pass it on to the lateral sinuses and the annexed jugular veins through which it returns promptly to the heart; whence, having received new energy, it returns again by the foree of that necessity in virtue of which the blood needs perpetual motion for its own conservation. Finally that the blood from the third longitudinal sinus passes back to the heart, and that contrary

to Riolan's belief, none of it passes through the vein of Galen into the choroid plexus and the ventricles, Wepfer demonstrates by experiment, for he says, that having injected fluid by means of a siphon into the longitudinal sinus he observed that it flowed not to the fourth sinus or vein of Galen, but rather to the lateral sinuses.

During centuries it had been accepted medical teaching that the animal spirits were generated in the ventricles of the brain and to conserve this ventricular function the most curious anatomical explanations were invented, such for example as that of Riolan. When, however, dissection commenced to disclose the true course of the cerebral vessels, not a few physicians began to doubt the traditional teaching and in the very vanguard of this number was Wepfer who, basing his physiological theories upon his anatomical findings, as we have briefly described them, placed the locus of the generation of animal spirits in the substance of the brain. In this belief he followed Hoffman, and like the latter, taught that the ventricles were merely the receptacles of the excrement of the brain, confirmed in this belief as he was, by the famous case of hydrocephalous reported by Vesalius, in which case the ventricles were much distended with fluid and yet the vital functions were preserved. This, argued Wepfer, could not possibly be the case were the ventricles the manufactory of the animal spirits, for then the very life of the individual would have been destroyed. And not only this, but also a further fact argues against the generation of animal spirits in the ventricles, namely, that the pia mater covers not merely the outer surface of the brain but likewise the cavities of the ventricles themselves, and this being so, the spirits could not leave the ventricles, since the pia mater contains no foramina permitting of their ingress or egress. Again the two lateral ventricles communicate with the third and this with the infundibulum which itself opens into the sphenoid bone, and consequently into the palate, so who can deny in these circumstances that the animal spirits would by this route escape from the ventricles? And indeed does not Nature herself by this very arrangement show her intention that the ventricles are meant to be the receptacles of the excrementitious products of the brain? On the other hand the arrangement of the vessels in the substance of the brain and the origin of all the nerves therefrom demonstrates beyond peradventure that in this cerebral substance the animal spirits are generated, whence they flow along the nerves throughout the whole body.

A most curious reason, among several others, is given by Wepfer to support his contention that the ventricles are filled with the excrement of the brain. Since the brain, he writes, especially in man, is of large size, and accordingly stands in need of much nourishment, there will be a copious amount of excrement which can be contained only in ventricles like those of the brain, for otherwise it would be necessary for men to expectorate constantly. Now as a fact much excrement is often expectorated in the morning after sleep, which excrement throughout the night must be retained in some capacious place, such as a cavity of considerable size; and since, aside from the ventricles, no such cavities exist in the brain, it is necessary to conclude that the excrement is concealed in them. And moreover, since one finds not rarely but frequently that the ventricles contain serous excrement, who can hope to find that in the same place where watery excrement is contained the most subtle spirits are likewise generated—those spirits which are later to permeate the nerves. Who will dare to say that these spirits will not be constantly contaminated by the fluid and made so harsh as to be rendered altogether inept for the work to which they are destined? Riolan, continues Wepfer triumphantly, dares not reply to this question; and as he passes over the arguments proving that the ventricles are the receptacles of excrement, so also this question he either judges unworthy of response, or perceiving the absurdity of the thing, prefers to hold his tongue rather than to speak badly.

Such then are some of the points of controversy between Riolan, the defender of Galen and Wepfer, the progressive Swiss who writes with disgust: "To this pass has medicine been reduced, that if anyone taught by reason and by faith in his senses, believes otherwise than the majority who glory in the authority of Galen, he straightway hears himself called an innovator and a smatterer by those tyrants of the intellect."

Leaving this part of his dissertation, let us now turn to Wepfer's views upon the causes and seat of apoplexy. It is not possible, he says, for anyone who is acquainted with the perpetual flow of the blood from the heart through the arteries and its return through the veins to the heart, to hold the same opinions concerning apoplexy as those who believe that the blood is replaced gradually by more recently generated blood or that for other reasons it is carried very slowly to the parts. In seeking for the proximate causes, the modes of its production, and the place affected in apoplexy, I shall follow in the footsteps partly of older and partly of more recent writers; and I set forth that apoplexy is produced in the first place, either because the afflux of the blood through the arteries is denied to the brain, or because the efflux of animal spirits from the cerebrum and cerebellum through the nerves and spinal cord is prohibited, or in certain cases, because of both causes acting together. These causes ought to be of primary importance since when they are present, all the animal actions suddenly cease, whether the apoplexy gives warning of its approach by prodromal symptoms or whether it occurs without warning, so that not even the most sagacious could foresee it.

Since the influx of blood to every living part is absolutely necessary for the production of heat and energy, the privation of this blood must result in the loss of the power of action. And not only is there loss of motion, but the mind also is disturbed, which occurs for the reason that some part of the brain is deprived of its blood. Anything therefore, which prevents the influx of blood to the brain through the carotids or the vertebral arteries, and its return through the jugular veins, is capable of producing apoplexy; and this influx of blood to the brain may be hindered by obstruction of the internal carotid and vertebral arteries, by compression of these arteries or finally by blood extravasated within the brain.

Among the causes producing obstruction Wepfer mentions in particular certain small fibrous bodies that he has found in the carotid and vertebral arteries, as well as in the heart, and he remarks that if these *corpora fibrosa* should occupy the lumen of the arteries at or near to their point of entrance into the brain these arteries would be obstructed in such fashion that either they would be occluded altogether or made so narrow that sufficient blood for nourishing its substance and for generating the animal spirits would be unable to enter the brain and hence an apoplexy would result. To this variety of apoplexy those are most liable who lead an idle life, those who are obese and those whose face and hands are livid and whose pulse is constantly unequal.

A second cause of obstruction may be found in the composition of the blood. We have previously pointed out, writes Wepfer, that the vertebral and carotid arteries send innumerable minute branches into the substance of the cerebrum and the cerebellum, and one may quite properly inquire whether or not it is possible for these small arteries to be obstructed so that the vital spirits would not be supplied in the proportion requisite for the generation of the animal spirits, and hence whether an apoplexy would result. To this question the reply must be made that there is no doubt that the blood may be, under certain circumstances, so mixed with viscid phlegm that its constant propulsion through the small arteries would produce obstruction and consequently an inevitable apoplexy. This obstruction does not, however, abrogate at one stroke all the animal actions, but now many, now few are affected depending upon the amount and degree of arterial obstruction. Hence certain patients are deprived of speech alone; if the vessels of one side are implicated, hemiplegia follows; if both sides are affected, a true apoplexy will be produced. And these are the apoplexies from which recovery follows often in a comparatively short time.

Regarding apoplexy caused by intracerebral hemorrhage Wepfer is very clear, for he observes that blood extravasated within the cranium will produce an apoplexy if it is copious in amount and lies in the deeper parts, particularly about the base, as three recent cases would seem to prove. For the blood within the arteries moves quickly and constantly during life unless there is some obstruction, and when a vessel is opened there is a great flow of blood in a very short time, as enormous hemorrhages often testify.

These hemorrhages many times deposit their blood not only in the substance of the brain but also in the cavities of the ventricles, and hence it is easy to understand how so great an outpouring of blood should cause apoplexy, for the brain cannot be deprived for even a short period, of its nourishment and the material out of which the animal spirits are formed without producing an abolition of all the animal actions. Effusion of blood within the cranium is caused either by the opening of the anastomoses of the vessels, or quite frequently by their rupture and laceration, or more rarely on account of their erosion.

That any hindrance to the efflux of animal spirits to the organs of sense and of motion could precipitate an apoplexy was accredited medical teaching from the time of Galen; for in such case it was believed all the parts would be deprived of sensory and motor power. In Wepfer's view of it, this is orthodox opinion, and he writes that an apoplexy will result whenever sudden obstruction or compression of the nerves prevents the flow of animal spirits through them. As regards obstruction, it may be said that since the cerebrum and cerebellum are filled with pores, not only on account of the many arteries coursing through them, but also because of the animal spirits which are propelled from their substance into the nerves, it is quite essential that the pores in the medullary substance remain patent to the arteries running therein, for unless this is so, the animal spirits will be found deficient, because the latter require a constant supply of vital spirits and when these are denied the animal actions straightway cease. If any humor in our body is capable of obstructing these pores in the medullary substance, assuredly serum must be mentioned first. For although serum appears to be normal to the brain, since it is found constantly in the ventricles, none the less, when it is present in too great amount it may obstruct many if not all of the pores, and thus produce great mischief. Flowing with the blood in the capillary arteries throughout the brain, the serum is thin and almost wanting in viscidity, so that it is able to pass through the more minute foramina and the narrowest passages, in the same way that water flows through the little cavities in a sponge. Now if this serum should boil and bubble up within the vessels and extrude itself into the substance of the cerebrum and cerebellum it would destroy the animal spirits and obstruct their exit, hence all the animal actions, not excluding the internal senses, would cease. The quantity of serum may be more or less, and the number of pores obstructed many or few; accordingly a more severe or slighter apoplexy will be produced.

If, however, the serum is to produce an apoplexy, a certain previous disposition of the cerebrum and cerebellum must be assumed. And if one may dare to explain the nature of this predisposition one may say that it consists in a too great laxity of the pores in the medullary substance because of which not only the more spirituous part of the blood but also the thinner portion of the serum transudes into them and destroys the animal spirits so necessary to activity. Among the factors favoring this predisposition Wepfer mentions narcotics, especially opium, absinthe, cannabis and wine. In speaking of wine he observes that daily indiscretions in drinking predisposes to apoplexy which occurs when the slightest occasion is given for the effervescence of the serum. Other causes of predisposition Wepfer finds in idleness, in sleep when too long protracted, and in old age. Therefore, he continues, it is not hard to understand that not all who abound in serum or in whose vessels it may boil up, are destroyed by apoplexy, but only those whose medullary substance, on account of errors of living or hereditary infirmity, has been invaded by serum which has been separated by a sort of fermentation from the mass of the blood, and which produces obstruction in this medullary substance.

It would be interesting, did time permit, to follow Wepfer in his description of the other humors, such as the bile, which when mixed with the blood, are capable of obstructing the free flow of the animal spirits; but enough has been said, perhaps, to justify our selection of Wepfer as a type of the most progressive physicians of the seventeenth century Renaissance. To enjoy the full flavor of his thought it is essential to read his writings, for so filled are they with fact and compact reasoning that to abstract them is of necessity to mutilate their logical coherence. In the small work which we have been describing, Wepfer presents probably the first systematic account of apoplexy, in which this was explained according to the new theory of the circulation of the blood. And throughout his work he remains true to the spirit of Harvey, the spirit expressed in his dedication where he writes: "Since this age, more than others, is especially happy, because of certain discoveries showing the admirable structure and most elegant economy of our bodies, the work of an omniscient Maker, I have been unwilling either thoughtlessly to believe the new or pertinaciously to defend the old, believing the saying trite of those who proclaim that they prefer to err with the ancients, rather than profess the truth with the moderns; for this is the part neither of a wise nor of a prudent nor of a loyal physician."

DISSECTING ANEURYSM.

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The literature contains descriptions of a great number of cases of dissecting aneurysms of all sorts affecting chiefly the aorta and either leading to rupture with the death of the individual or to healing by the organization of the hemorrhage or by the establishment of a new channel between the walls of the aorta through which the blood also circulates. This literature has been collected and analyzed by Bostroem [1], by Flockemann [2] and most recently by Franz Schede.[3] The following description of several cases, therefore, is given merely to add to the material and to record one or two peculiar results which may follow the extravasation of blood in this way:

CASE 1.—T. C. W., white, male, age 58, medical No. 2662, had been treated several times in the Johns Hopkins Hospital for dyspnœa and epigastric pain. During his last admission the heart sounds were rather feeble and there was a diastolic murmur at the left border of the sternum, not obliterating the second sound. On the morning of February 20, he was walking about the ward feeling fairly well, but at noon complained of pain in the stomach and weakness and was put to bed and died suddenly in the afternoon. The autopsy (No. 389) was reported as follows:

Anatomical Diagnosis: *Arteriosclerosis; cardiac hypertrophy; dissecting aneurysm of aorta with rupture into pericardial sac; hemorrhage of pericardium; chronic diffuse nephritis; chronic passive congestion of viscera.*

The body is that of a very fat, heavily built man 176 cm. long. The pericardial cavity contains about 1000 cc. of bloody fluid and dark clots. Both layers of the pericardium are smooth. The heart is moderately enlarged, weight 620 gr., the left ventricle hypertrophied, the thickness of its wall being 20 mm., the length 10 cm. The right ventricle is 8 mm. in thickness and 8 cm. in length. The tricuspid and pulmonic valves are quite delicate. The mitral valve somewhat thickened and opaque with a few yellowish sclerotic patches. The aortic valves are thickened especially at the corpora arantii, and are somewhat degenerated in patches but not calcified. The aorta is the seat of an extensive atheroma with calcified patches and atheromatous ulcers as well as areas of intimal thickening and fatty degeneration. Beginning at the root of the aorta there is a tear measuring 3 cm. in length, extending through the whole wall of the aorta and on its outer surface where it lies against the right auricle measuring 4½ cm. in length and extending upward to within a short distance of the innominate artery. The adventitia of the artery is dissected up beyond the tear as far as the origin of the left subclavian and almost encircling the artery. There is another tear in the inner wall 1½ cm. above the innominate which is somewhat irregular and arched in appearance with the concavity of the arch looking toward the heart. This is a transverse tear, measuring 8 cm. across, and thus taking in all but one centimetre of the circumference of the aorta. The adventitia is deeply blood-stained over the tear and is thin and membranous; its inner surface is especially deeply stained and small clots and bits of fibrin adhere to it, as they do also to the outer surface of the torn media. It was evidently through the first and larger tear which extended also through the adventitia of the aorta, that the extravasation into the pericardium took place.

The other organs present nothing of especial interest.

In this case we have to deal with a perfectly fresh rupture of the inner walls of the aorta and in one place also of the outermost layers causing splitting of these walls and fatal hemorrhage. Doubtless the fatal effect was due not so much to the loss of blood as to the compression of the heart produced by the extravasation of blood into the relatively unyielding pericardial sac. The arterial disease was in this case very marked, but there was no obvious strain or other cause for traumatic rupture, although it was possible that the rupture may have occurred while the patient was straining at the stool. This, however, does not appear in the history. It is further to be observed in this case that there is a rather moderate hypertrophy of the left ventricle.

CASE 2, illustrated in Fig. 1, was from a patient upon whom an autopsy was performed in the neighboring almshouse. No history had been obtained, and but little was known of the man's general condition; he was about 58 years old. At autopsy there was found a high degree of arteriosclerosis affecting not only the aorta but also the larger arterial trunks. The heart is not particularly enlarged. In the aortic arch just below the orifices of the left carotid and subclavian arteries there begins a tear which

[1] Bostroem. Deutsches Archiv f. klin. Med., 1887, Vol. 42, pp. 1-74.

[2] Flockemann. Munch. Med. Woch., 1898.

[3] Franz Schede. Virchow's Arch., 192, 1908.

extends in a somewhat arched direction downward along the descending portion of the arch for a distance of 43 cm. The edges of this are sharply cut as if with a knife. It extends only part of the way through the walls of the aorta, the outer layer largely composed of adventitia being unbroken. The aorta is throughout quite markedly sclerotic, but there is practically no calcification or ulceration of the intimal lining, the sclerosis consisting of the formation of thick, somewhat opaque plaques. The splitting of the aortic wall extends from the tear described anteriorly and downward, so that the wall of the aorta is divided into two layers except about the origin of the intercostal vessels. This splitting extends downward as shown in the figure to the bifurcation of the aorta and even far along one of the common iliac arteries. The other common iliac is not affected, nor is the splitting by any means so complete with regard to the iliac as it is in the aorta. Just above the bifurcation there is a large hematoma which bulges the wall of the aorta inward, and must have very considerably narrowed its lumen. The hematoma itself projects forward about 3 cm. from the anterior surface of the aorta in the form of a sac which is filled with a laminated clot. The splitting is not by any means confined to the aortic wall but extends as shown in the figure quite far along the mesenteric and renal vessels.

Evidently, this dissecting aneurysm was not immediately followed by the death of the individual but on the contrary there was time for the formation of a thrombus of firm laminated appearance in the sac which had been produced by the extravasation in front of the bifurcation of the aorta. Close examination shows that the cleavage takes place usually in the substance of the media, leaving a little of the media attached to the adventitia and not falling precisely between the media and the adventitia. It may be observed in any aorta in which there is a high grade of arteriosclerosis, that it is fairly easy to split the wall of the aorta. This is far easier in the sclerotic aorta than in the normal where it is a matter of some difficulty to tear apart the layers. In the sclerotic aorta it may be seen with the naked eye that such cleavage takes place somewhere in the middle of the musculature. This seems to support the view held by most authors in opposition to Bostroem and Flockemann that the sclerotic disease of the aorta is the chief factor in predisposing the artery to such tears and splittings as just described.

Case 3.—This case is represented only by an old specimen in the Pathological Museum in the Johns Hopkins Hospital, but it may be briefly described on account of some slight peculiarities. The specimen consists of the aorta from an adult person which is somewhat less sclerotic than that just described and pictured. A considerable part of the wall is quite smooth and apparently elastic, but over the anterior portion there are numerous, thick, elevated plaques of sclerosis. These, however, are not particularly degenerated, and there is no calcification nor ulceration. In the arch of the aorta beginning at the origin of the left subclavian artery there is a gaping tear which extends about 3 cm. downward along the greater curvature of the arch. It extends only part of the way through and exposes the adventitia which forms the outer wall together with a portion of the media. The thin layer of media thus torn off is very distinctly visible on section. The splitting of the wall continues down at least to the abdominal portion of the aorta.

This specimen does not include the coeliac axis but the aorta has been opened along the portion which was not infiltrated by the blood which extravasated between the walls, and the specimen thus presents along its whole length a great convex ridge which occupies half of the circumference of the aorta, and which consists of the outer walls of the aorta distended with a firm clot of blood. There seems to have been no rupture either into the interior of the aorta at another point or externally, and there is therefore no reason why such a dissecting aneurysm, which really is nothing more than a hematoma in the walls of the aorta, should not have healed completely by the organization of the clot. There is, however, in its present state little or no sign of organization.

Case 4.—L. R., negro, age 30, medical No. 15,454, has been treated in the Johns Hopkins Hospital one year previous to his final admission, at which time diagnosis of aneurysm of the aorta had been made. At the final admission the patient was found to be suffering from an arthritis with symptoms of general septicemia, fever, sweating, etc. The heart at that time seemed somewhat enlarged. The point of maximum impulse was in the sixth space 12.5 cm. from the mid-sternal line. The relative cardiac dullness extended 3 cm. to the right and 13.5 cm. to the left. There was much præcordial heaving, and a local pulsation in the second, third, fourth, fifth and sixth interspaces extending far out in the first and second left interspace. There was systolic retraction in the fifth interspace. The heart sounds were clear but dull with a soft diastolic murmur in the third left interspace with a loud ringing second sound. The diastolic murmur extended along the left sternal margin but was not transmitted to the neck. The man died in delirium with very high fever.

Anatomical Diagnosis at Autopsy (No. 2087): *Aneurysm of the ascending arch of the aorta; dissecting aneurysm of descending aorta with establishment of permanent secondary channel; obliterative pericarditis; acute purulent arthritis; acute hemorrhagic nephritis; general streptococcus septicæmia.*

The body is that of a slenderly built negro 166 cm. long. Only the heart and aorta need be described. The pericardial cavity is completely obliterated by adhesions which bind the two layers together everywhere over the heart. Over the upper portion of the heart the adhesions are entirely fibrous, while over the more apical part there is a great deal of yellow glutinous material infiltrating the adhesions. On opening the heart (Fig. 2), it is found that the walls of the right auricle are somewhat thickened. The tricuspid valve is delicate and competent. The walls of the right ventricle measure 7 mm. in thickness and are quite firm. Pulmonary valves are delicate and competent. The mitral ring measures 8 cm. in circumference, the valves being slightly thickened along their edges. The wall of the left ventricle, somewhat thickened, measures 2 cm. The aortic orifice measures 8 cm. in circumference. The valves are delicate. The anterior coronary segment is normal in size, while the posterior segment is greatly enlarged and widened. Behind the posterior segment lying over the right ventricle and bulging into it behind the tricuspid valve and below the pulmonary valve is a large sac which measures 7 cm. in diameter, and the lining of which is very rough and covered with plaques of sclerosis. This extends in a sort of retort form up to the summit of the arch of the aorta and then continues over into what appears to be the lumen of the aorta. It is found, however, that in the bottom of this as it is cut open there lies a tube which is composed really of the inner walls of the aorta and the lumen of which is the real lumen of the aorta. This begins at the summit of the arch of the aorta, that is at the neck of the aneurysm, by a large orifice, the ragged edges of which project into the lumen of the artificial canal. Across the space between the actual aorta and the canal formed by the dividing wall, there run cord-like trabeculæ and adhesions



FIG. 1.

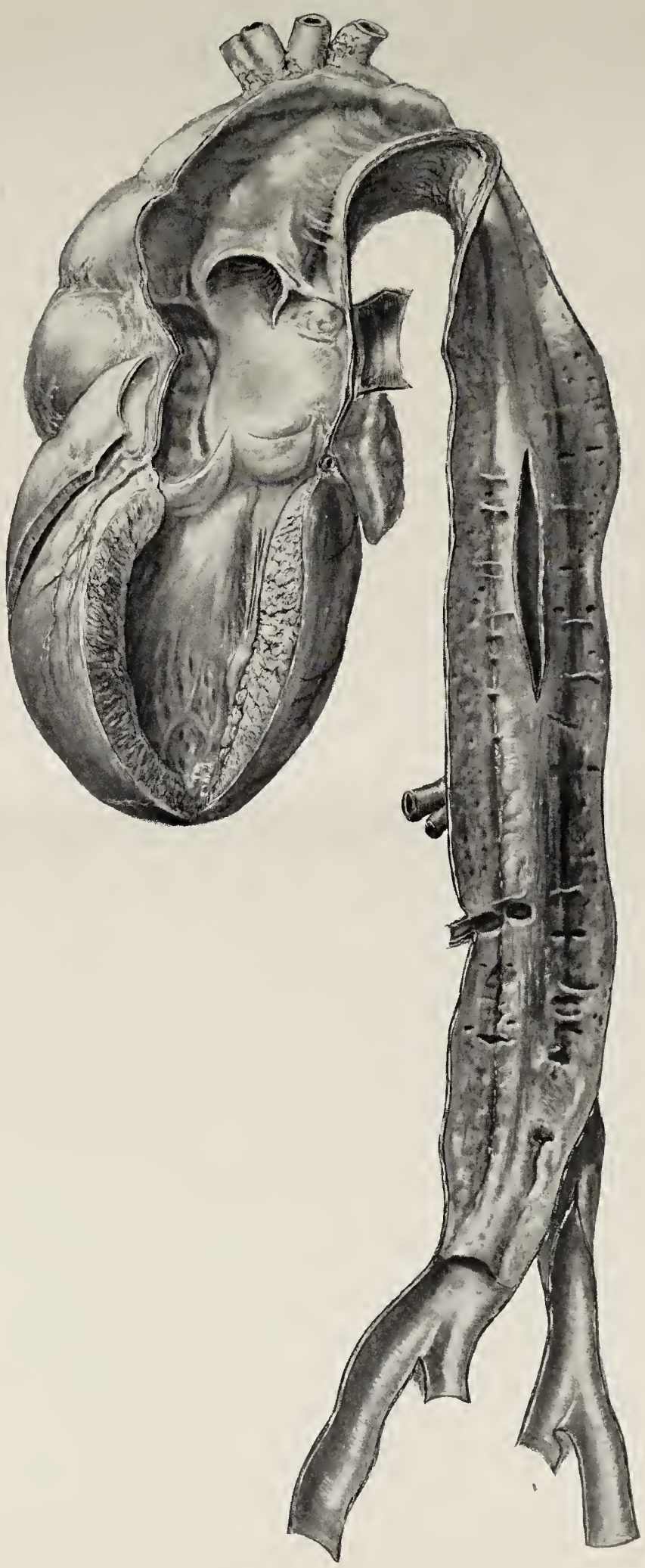


FIG. 2.



FIG. 3.

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in considerable numbers. This outer canal lies in front and to the left of the aorta and does not completely encircle it; in other words the cleavage of the aortic wall which has taken place in front and to the left of the aorta affects only about half of its circumference. This channel is lined by endothelium and is fairly smooth. It has evidently allowed the circulation of blood to go on just as it had done through the aorta. The splitting extends as is shown by opening the aorta down into the left common iliac vessel for a distance of 3 or 4 cm. from the bifurcation where the septum between the inner and outer tubes ends in a thin concave edge; both channels coalescing into the normal common iliac artery.

The condition here is exactly similar to that seen in the descending portion of the arch of the aorta where the cleavage began. The intercostal vessels are in many instances torn through at their origin and although there is a hole left in the inner wall, the artery really opens from the outer tube; similarly the right renal has been torn through and that artery also opens from the outer tube. The left renal artery and the coeliac axis are normal, since they open from the anterior portion of the aorta through which no holes are torn. A probe passed through the right common iliac enters the true aorta directly since no splitting has taken place down in that direction.

In this case the process is one of long standing. The death of the man was in no way connected with formation of the dissecting aneurysm which was completely healed and perfectly compatible with life. The aorta showed, it is true, marked degenerative and sclerotic changes within the region of the actual saccular aneurysm but elsewhere as shown just above the aortic valve and throughout the lumen of the aorta the intima is fairly smooth. The man was quite young but even the existence of a relatively normal intima throughout the greater part of the aorta does not prove that the dissecting process did not arise on the basis of the pathological alteration, for we have adjacent to this the formation of a true aneurysm. The regeneration of endothelium as a lining of the whole of the newly-formed tube is a remarkable adaptation to the new condition produced. So too the functioning of the intercostal and renal arteries after their inner wall had been torn through, so that they end abruptly in the newly-formed outer tube of the aorta shows the remarkable power of adaptation to unfavorable conditions.

The question as to the mechanism of the second rupture back into the aorta has been discussed by several authors without throwing much light on the subject. It seems to me probable that chance has a great deal to do with this. The blood in the outer tube bursting outward or inward wherever it finds a weak place in the confining wall. Apparently the new growth of endothelium has not proceeded entirely from the ends of the uniform tube, but it may well have been added to by an extension through the holes produced in the inner tube by the tearing away of the arteries. A case almost precisely similar to this is described and pictured by Schede.

CASE 5.—T. K. C., male, age 60 years. The patient has shown mental disturbances for several years, in epileptiform attacks and aphasia. These were associated with accentuation of his original peculiarities, but with no delusions. On Monday, May 21, he complained of a violent pain which he could not locate. This continued for a short time but gradually improved. The patient was extremely violent and intractable. On Monday, May 28, he became much distended, complained of a pain in the appendix region, and developed jaundice. The temperature rose to 100° F., the leucocytes to 20,000, and an exploratory laparotomy was performed but revealed only extreme distension of the colon. There was no peritonitis. A colostomy was done with relief of the distension, but the man died on Tuesday, May 29. The autopsy (No. 2727) resulted in the following:

Anatomical Diagnosis: *Arteriosclerosis; chronic diffuse nephritis; cardiac hypertrophy; dissecting aneurysm of the aorta; hemorrhage into the peri-aortic tissues and the pleura; compression of the lungs; paralysis of the intestines with great distension; acute splenic tumor; encephalomalacia.*

The body is that of a stout man 170 cm. in length, deeply jaundiced and extremely fat. The peritoneal cavity contains very little turbid fluid about the colostomy wound, but there is no general peritonitis. The intestines are enormously distended, the small intestine being much more distended than it was at the operation. The large intestine has been relaxed by the operation, but there are numerous tears in its wall, extending from the cæcum to the splenic flexure which seem to have been due to stretching as they somewhat resemble lineæ albicantes. They extend down through the muscle spreading apart the muscle bundles over considerable patches of the intestine. The muscle is flecked with hemorrhages. There is nothing anywhere which could have produced an obstruction, and no sign of obstruction can be made out anywhere, on careful examination from duodenum to anus, nor is it possible to produce a volvulus by twisting the intestine for the mesentery is too short. The mucosa is normal throughout. It seems therefore that the wall of the intestine must have been paralyzed in some way to allow such distension.

The thoracic cavity. The left pleura contains no excess of fluid, and its surfaces are smooth. The right pleura, on the contrary, contains a large quantity of blood which is partly fluid, partly in large clots. The posterior portion of the right lung is entirely collapsed as a result of this compression, and the blood has permeated the tissues at the hilum of both lungs, and has run along the interlobular tissues, marking out the lobules with dark red lines. *Heart* is somewhat enlarged. The surface is everywhere smooth and covered with fat. The left ventricle is particularly firm. The right auricle contains only post-mortem clots. The endocardium of the right ventricle of the tricuspid valve, and of the pulmonary valve, which is abnormal in being composed of only two large leaflets, is quite delicate. Similarly the valves on the left side of the heart are delicate and competent, and the endocardium is everywhere smooth. The left ventricle measures 8½ cm. in length; its wall is distinctly thickened (25 mm.) and firmer than normal. The coronary arteries are tortuous and contain plaques of sclerosis. On removing the heart, lungs and abdominal organs, a large sausage-shaped mass is felt projecting into the left pleural cavity. This is dark red in color and extends down to the diaphragm. The tissues in the posterior mediastinum are everywhere, on both sides, infiltrated and distended with blood, which reaches down into the lumbar region. On more careful examination, it is found that this mass is produced by an extensive hemorrhage surrounding the aorta, œsophagus and even the trachea (Fig. 3). The hemorrhage extends upward to a point below the roots of the arteries springing from the arch which are not surrounded by blood and downward to the level of the renal arteries, is about 5 cm. in thickness, and forms a tense elastic mass bulging the pleura and peritoneum forward where it is covered by them. On cutting into this mass, it is found to be made up of a clot of blood somewhat variegated in appearance and traversed by shreds of tissue. The aorta itself shows an extremely sclerotic intima; the whole inner surface being covered with patches of varying appearance, some of which are prominent and smooth superficially, while others

are slightly roughened, some are translucent, while others are opaque and yellow. The intervening portions of the aorta are mottled with smaller and less elevated patches of yellow opacity. In the descending arch 3 cm. from the orifice of the subclavian artery there is a hole 1 cm. in diameter with somewhat irregular margins which are sunken below the surrounding surface. This lies in the middle of an especially diseased area where the artery wall is very soft and blackish with mottlings of yellow. Just outside this there is a small sac-like cavity containing a soft blood-clot; the outer wall of which seems to be composed of the adjacent tissues, but it appears to have existed for some time because the wall is partly composed of granulation tissue. Just below this at about the level of the first intercostal it is found that the walls of the aorta are split apart, the split taking place in the substance of the media and running almost all of the way around except for a band along the posterior surface through which the intercostal arteries pass out. This split contains clotted blood and is in direct communication with the adventitial sac. In the upper part the smaller vessels are apparently not followed by the split, nor is this to be made out in the vessels of the coeliac axis, etc. The walls of the aorta are, however, separated down to its bifurcation.

In this case we have apparently a rather gradually produced extravasation which gave rise to the intense pain which the man could not locate, and the more serious symptoms are doubtless to be referred largely to the extravasation of blood, not in the wall of the aorta, but outside of it altogether. It seemed possible at the time of the autopsy that the pressure of all this extravasated blood upon the splanchnic nerves might in some way account for the paralysis and distension of the intestines. Stimulation of the splanchnic would tend to cause a dilatation of the blood-vessels in the intestine with but little further effect, while paralysis of the splanchnic might allow a vaso constriction which would probably be followed by peristaltic spasm. There seems to be no evidence that this would afterward result in the distension of the intestine.

In all of these cases there was a marked arteriosclerotic change of the aorta in which condition, as we have pointed out, the cleavage of the arterial wall occurs more readily than in health. In most of the cases there has been some hypertrophy of the heart, such as so frequently accompanies arteriosclerosis. It still seems probable, however, that a sudden strain elevating the blood pressure must in conjunction with these two conditions be the final cause of the breaking through of the wall and the production of a saccular aneurysm. After that, the effects of extravasation are purely mechanical. That such extravasation is not necessarily fatal is shown by at least two of our cases in which considerable advance had been made toward healing.

PERSISTENT BACTERIURIA.

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Bacteriuria is a condition which was first described in 1881 by Roberts (1). He reported a case in which his attention was attracted by the appearance of the freshly voided urine. This presented a peculiar opalescence and exhaled a disagreeable odor. On microscopic examination the peculiar appearance was found to be due entirely to the presence of enormous numbers of bacteria, both cocci and bacilli. A few years later a case was reported by Schottelius and Reinhold (2), and in 1888 a work of Ultzman (3) was published in which a chapter was devoted to bacteriuria.

Increasing numbers of observations have been reported and the condition studied by many workers, particularly Rovsing (4), Krogius (5) and Janet (6). To-day bacteriuria is a well-recognized affection and one not infrequently encountered, and is without doubt often mistaken for mild cystitis. The bacteriuria occurring during or following typhoid fever and due to the *B. typhosus* is a form of the disease long recognized and one with which the profession is most familiar.

Bacteriuria is really a remarkable condition, and one at first sight difficult to understand, for it apparently upsets our ideas of bacterial invasion which are generally associated with inflammatory phenomena. It is difficult to reconcile the presence of enormous numbers of bacteria in the bladder urine persisting for months and even years without causing an inflammatory reaction on the part of the vesical mucosa.

There is some difference of opinion regarding the application of the term bacteriuria. Predohl (7) would limit its application to those cases in which a healthy individual without any clinical evidence of inflammation in the urinary tract and without recognizable cause voids urine which in its fresh state contains bacteria. He would not include those cases in which a previous inflammation or diseased focus existed. According to Krogius the condition is characterized by the presence of enormous numbers of bacteria in the freshly voided urine and the absence of any pronounced symptoms of inflammation of the urinary tract. He does not believe the term should be applied to cases in which it is a phenomenon secondary to an infectious nephritis or part of a general infection. Rovsing distinguishes two types of cases, one in which the urine is absolutely free from pus, another in which a few pus cells are present, but the peculiar cloudiness of the urine is due to bacteria. In his opinion bacteriuria is most frequently of renal origin.

It in reality represents an infection different only in degree from ordinary cystitis. In one the infection is present without any inflammatory reaction on the part of the bladder wall, while in the other we have the infective agent in the urine plus involvement of the vesical mucosa. As a rule the disease is one which yields readily to treatment, but occasionally it may be most intractable and resist all efforts to dislodge the in-

vading organisms. The series of cases reported below are of the intractable type and incurable as far as all our efforts have been concerned. In two cases the bacteriuria was of renal origin, and in two cases secondary to an infection of the prostatic urethra, prostate and seminal vesicles.

CASE I.—R. M., white, age 27, single. Alkaline bacteriuria of renal origin. Chronic prostatitis. Intermittent phosphaturia. Organism: *Staphylococcus albus.*

He was seen for the first in September, 1907, complaining of cloudy urine and intermittent attacks of burning in the urethra and frequency of urination. Seven years ago he had a sore on his penis but this was not followed by any secondaries. Six years ago he had contracted gonorrhœa following which he had a discharge which persisted for some months, but finally ceased without any special treatment. Four years ago he noticed that his urine had become cloudy, but this was attended with no special symptoms at that time. This cloudiness of the urine has been persistent and at intervals he has suffered from slight attacks of frequency and severe burning in the urethra on urination. During these exacerbations considerable quantities of a white sand-like substance have always been passed. In the interval between these attacks when this white sand-like material is not excreted he is comfortable and entirely free from symptoms. The general nutrition has always been maintained and he has never had any pain in the region of the kidneys or along the course of the ureters. He was first seen during one of the attacks above noted. On physical examination his chest and abdomen were normal. There was no tenderness over the kidneys or ureters. The urine when voided in three glasses was quite cloudy in all of them and a white granular sediment settled to the bottom. The urine was slightly but definitely alkaline and negative for albumin and sugar. The addition of acetic acid caused some slight clearing of the urine, but it still remained definitely hazy. The microscopic examination of the precipitate which was composed of small whitish granular masses showed that it was a mixture of amorphous and triple phosphates with large masses of a Gram staining coccus. With the exception of the first glass which contained a few pus cells the urine was entirely free from pus. Cystoscopic examination of the bladder showed no sign of inflammation, the mucosa being perfectly normal. On rectal examination the prostate was slightly enlarged and somewhat indurated in areas, while the prostatic secretion contained a fair number of pus cells, but also numerous normal elements. The seminal vesicles were small and soft.

He was instructed to drink large quantities of water and was given thirty grains of urotropin a day. Within a short time the phosphaturia disappeared, but a distinct haziness of the urine still remained. It was then decided to catheterize both ureters to determine if the organisms were not being excreted from the kidneys. Catheters were introduced, about 4 cm. on each side, and the first 5 cc. collected was discarded. About 10 cc. was then collected from each ureter. The urine from both ureters was apparently clear with the exception of small floating particles. On being centrifugalized and examined microscopically it was found that these small grayish masses were clumps of cocci, but no leucocytes were observed. The same condition was present in the urine from both kidneys and the reaction of each was slightly acid. Cultures from each catheterized specimen as well as from the bladder urine showed a pure growth of *Staphylococcus albus*. Urotropin was then increased to sixty grains a day, and for a short time the urine became almost entirely clear, but the cloudiness soon recurred notwithstanding the large doses of urotropin. Subsequently both ureters were catheterized and the pelvis of each kidney was washed with a 1 per cent solution of protargol. This procedure was repeated several times at weekly intervals, but as no improvement was noted following pelvic lavage it was discontinued. In January, 1908, the *Staphylococcus albus* was again isolated from the urine in pure culture and a vaccine prepared. The vaccine was made from an 18-hour agar culture. He has been given weekly injections of 200 to 400 million organisms during a period of three months, but the vaccine has apparently not had the slightest effect. At the present time the infection is still present. While taking urotropin he is comfortable and free from phosphaturia, but on discontinuing it for any length of time the phosphaturia returns with its uncomfortable symptoms.

CASE II.—P. S., white, age 24, married, E. 11,497. Acid bacteriuria of renal origin. Acute locomotor ataxia. Organism: *B. coli communis.*

He was first seen in August, 1907, complaining of slight pain on urination, some frequency and considerable difficulty in starting the flow. He gives a history of gonorrhœa six years ago which was of short duration. About three years ago he had a sore on the penis, but this was not followed by any secondaries and he has never taken any treatment for syphilis. One year ago, however, he began to develop symptoms of locomotor ataxia and this has developed very rapidly until at present he is hardly able to walk. Six months previously he had an attack of dysentery which lasted five weeks and during this attack noticed for the first time cloudiness of the urine together with some pain and frequency. For almost a year he had had more or less difficulty in starting the flow, due unquestionably to his locomotor ataxia.

Examination.—Patient is a frail sickly-looking young man with well-developed signs of locomotor ataxia. Chest and abdomen negative. No tenderness or pain over kidneys. External genitalia normal.

On rectal examination the prostate was small, soft and apparently about normal. Microscopically the prostatic secretion shows a few pus cells, but for the most part it was composed of normal elements. The urine voided in three glasses had a peculiar haziness characteristic of bacteriuria. Microscopic examination showed a few pus cells in the first glass while the last glass contained no pus cells, but an enormous number of Gram negative bacilli. The urine is acid and contains no sugar or albumin. The urethra shows no stricture and no inflammatory indurations. A catheter passes readily and withdraws no residual urine and the bladder capacity is normal. Careful inspection of the bladder mucosa through the cystoscope reveals nothing abnormal and with the exception of a slight reddening about both urethral orifices the examination was negative. He was instructed to drink large quantities of water, to take 40 grains of urotropin a day and was given daily intravesical irrigations of bichloride 1 to 60,000. The pain and frequency of urination almost immediately disappeared, and there was distinct but not entire clearing of the urine. As long as the above treatment was continued the urine remained comparatively clear, but on discontinuing urotropin it promptly returned to its first condition. It was finally decided to catheterize the ureters, and catheters were introduced, about 4 cm. on each side. The right kidney acted freely, but for some reason or other only a few cubic centimeters were obtained from the left side during a period of fifteen minutes. During this period about 20 cc. were collected from the right ureter, the first 5 cc. being discarded and only the last portion saved for examination. This last portion of urine was apparently clear to the naked eye, but numerous small particles could be seen. On microscopic examination, however, these small masses were found to be clumps of bacilli, a condition similar to Case I. As only a few cubic centimeters had been collected from the left ureter microscopic study was not considered of any value on account of the possibility of the first portion containing bacteria from the end

of the catheter which had necessarily come in contact with the vesical mucosa. A culture from the urine gave a pure growth of *B. coli communis*. A vaccine was then prepared from an 18-hour agar culture of his own organism and the urotropin was discontinued. Injections of 100 to 200 million bacilli were then given subcutaneously in the upper arm at weekly intervals. The injections have caused no local nor systemic reaction. He has received up to the present time 14 injections, but no improvement can be noted from the vaccine therapy.

Case III.—A. M., white, age 32, single. Bacteriuria secondary to posterior urethritis and chronic prostatitis. Organisms: *Staphylococcus albus* and *B. coli communis*.

He was seen for the first time in July, 1907, complaining of a "bearing down pain" in the rectum, and an aching at the neck of the bladder a few minutes after urination. He contracted gonorrhœa for the first time ten years ago and since then has had the disease several times, the last attack being three years ago. During one attack 5 years ago he developed a swelling of the right epididymis. Two years ago he contracted syphilis for which he has conscientiously taken treatment. His present symptoms date back 8 years and have been much more severe than at present. He gets up once or twice at night to void and urinates during the day about every 3 hours. He has no hesitation or difficulty in voiding and his stream is full and large. Sexual powers are good, but ejaculation is precocious. The ache at the neck of the bladder soon after voiding and the "bearing down pain" in the rectum were the symptoms for which he sought relief.

Examination.—Patient was a rather neurotic looking young man, but in good physical condition. His chest and abdomen were negative. The external genitalia were normal and there was no urethral discharge. The urine when voided in three glasses showed slight cloudiness in the first glass while the second and third glasses were clear.

On rectal examination the prostate was somewhat enlarged and the consistency of the gland as a whole was quite firm. The surface was rather smooth. There were no peri-prostatic adhesions. The prostatic secretion was rather scanty and almost entirely composed of pus cells.

He was treated by prostatic massage, dilatations of the posterior urethra, etc., for several weeks when it was noted that the urine had become slightly hazy, but no urinary irritability had appeared. Microscopic examination showed that the cloudiness was due to a coccus. Large doses of urotropin were immediately ordered, but had only a partial effect upon the cocciuria. Cultures from the urine gave a pure growth of *Staphylococcus albus*.

The bladder upon cystoscopic examination appeared perfectly normal. This condition of the urine persisted unchanged for several months, the reaction varying somewhat from a slightly acid to a slightly alkaline condition without the formation of any phosphatic deposits. The urine, however, on standing became in a few hours strongly alkaline with a heavy precipitation of phosphates. The presence of the infection seemed to produce no special symptom.

A few months later a secondary invasion with a bacillus was noted and this in culture proved to be the *B. coli communis*. The invasion of the colon was productive of no special change except increased cloudiness of urine. Repeated cystoscopic inspection of the mucosa never revealed any evidence of inflammation. Catherization of both ureters performed while the condition was a pure cocciuria and later after the secondary invasion with the *B. coli communis* showed the urine from both kidneys entirely clear and microscopically negative for organisms. Urotropin, instillations of silver nitrate, prostatic massage and vesical irrigations failing to have any effect upon the bacteriuria a vaccine was prepared from his own organism. He was first given injections of 100 to 300 million of *Staphylococcus albus* at weekly intervals during a period of two months without, however, any apparent diminution in the number of staphylococci in the urine. The injections of the staphylococcus vaccine were then discontinued and injections of his own colon in doses of 100 to 200 million were instituted. He has received so far about 10 injections. The vaccine injections have not produced the slightest effect upon the bacteriuria.

Case IV.—S. D., white, age 30, married. Alkaline bacteriuria. Chronic posterior urethritis, prostatitis and vesiculitis. Phosphaturia. Organism: *Staphylococcus albus*.

Admitted July, 1907, complaining of pain in the right kidney region and the passage of large quantities of sand accompanied by severe burning pain in the urethra. He contracted gonorrhœa about 5 years ago and had a discharge for one year. He dates his symptoms to the attack of gonorrhœa 5 years ago. His urinary symptoms are intermittent, at times he voids at fairly normal intervals and again has attacks when he micturates as often as 5 to 10 times at night and every few minutes to a half hour during the day. During these exacerbations he has noticed that the urine has increased cloudiness and that considerable quantities of sand are passed. He suffers a great deal from a severe aching pain in the perineum and a constant dull ache over the right kidney region. This pain in the kidney region, however, does not radiate and does not simulate very closely renal colic. The general health has remained good although patient states that his sufferings at times are agonizing.

Examination.—Patient is a well-nourished man. Chest and abdomen are negative. There is no tenderness over either kidney. External genitalia are normal. There is no urethral discharge. The urine when voided in three glasses is cloudy in all three and a considerable white granular precipitate forms. On addition of acetic acid a large part of the cloudiness disappears, but a distinct haziness still persists. Microscopic examination of the first glass shows a few pus cells, while the third glass shows no pus, but enormous numbers of a Gram staining coccus.

Precipitate is composed of triple phosphates. The reaction of the urine is alkaline and it contains no sugar or albumin.

Rectal examination.—The prostate was enlarged, indurated and quite nodular. The induration is especially marked at the upper pole and continuous with enlarged and indurated seminal vesicles. The secretion obtained from the prostate and the seminal vesicles shows a large number of pus cells. The urethra has no stricture or areas of induration.

The cystoscopic examination shows that the bladder mucosa is entirely normal as is also the prostatic orifice.

Under prostatic massage, dilatations of the posterior urethra, instillations of silver nitrate, large quantities of water and large doses of urotropin the patient soon showed marked improvement in his symptoms. While taking large doses of urotropin the urine was usually neutral or slightly alkaline and he was entirely free of the distressing symptoms accompanying the passing of the sand. The bacteriuria persisting despite all treatment the ureters were catheterized, the catheters being introduced about 4 cm. on each side as in the other cases and the first portions of the urine discarded, and only the last portions collected were saved for examination. The urine from each side was perfectly clear, had a slightly acid reaction and was negative for organisms or pus cells. Cultures which were made from the urine gave a pure growth of *Staphylococcus albus*. A vaccine was prepared from this as in the other cases and doses from 100 to 300 million were given at weekly intervals during a period of 4 months. The vaccine, however, has proved absolutely valueless up to the present time, and has been discontinued.

In the four cases reported some variety of the *Staphylococcus albus* was the offending organism in three, being once

associated with the *B. coli communis*. In one case the *B. coli communis* was found alone. The colon is apparently the organism which has been found most frequently by the various observers. In the series of cases reported by Rovsing the *B. coli communis* was the organism found in every instance. Predohl as a result of his observations concluded that bacteriuria was always due to this bacillus. However, bacteriuria due to other organisms, particularly varieties of the staphylococcus have been observed, while three of the four cases above reported were due to cocci, all varieties of the *Staphylococcus albus*. It is well known that both the *Staphylococcus albus* and the *B. coli communis* may have little or no pathogenicity, and this will explain to a certain extent the growth and persistence in the urinary tract without producing any inflammatory phenomena. We have never seen a case of bacteriuria due to the more pathogenic organisms such as the *Staphylococcus pyogenes aureus* or any of the proteus group, nor have we found any such case reported. It is very probable that the more pathogenic organisms when they gain a foothold soon produce a reaction on the part of the tissues and the picture becomes an inflammatory one. Melchior (8) has shown that the mere introduction of the proteus of Heuser is sufficient to set up a violent cystitis.

The route of invasion or the passage-way through which organisms gain their entrance to the bladder is essentially the same in cystitis and bacteriuria. When the bacteriuria is persistent it is probably essential to have some focus in the urinary tract or neighboring organs which continually pours bacteria into the bladder urine. In cases where an obstruction is present with residual urine this urine may serve as a culture media, particularly so if it is albuminous. One can readily understand the persistence of the organisms in such cases without any contributing focus. Rovsing has experimentally shown that if a culture of bacteria is introduced into a normal bladder all of the bacteria will be expelled in the course of a few days, so that it would seem necessary in order to explain the persistence of bacteriuria to have some point from which the organisms gain access to the bladder.

In our four cases the condition was of renal origin in two, secondary to chronic posterior urethritis and prostatitis in one, and associated with chronic urethritis, prostatitis and vesiculitis in the other.

In the two cases of renal origin it is probable that a focus of infection of mild grade was present in the superior urinary tract. Just what the nature of the lesion in these cases may be it is impossible to say as no microscopic study of the renal tissue has been made in cases of this character, as far as we have been able to determine. In the cases reported by Krogius (5) and Stenbeck (9), in which an autopsy was performed, the bladder and kidneys were said to be normal in appearance but unfortunately no microscopic examination of the tissues was made. It seems fairly probable that an apparently healthy kidney can excrete organisms picked up from the general circulation, and in this way give rise to a temporary bacilluria. That organisms, however, in enormous numbers and over a period of months or years could be strained through the kidneys without any focus in the kidney itself is highly improbable.

In the type of case secondary to infection of the prostatic urethra, prostate and vesicles the method of invasion of the urine by the organisms is not inexplicable. The bacteria having gained a foothold in the posterior urethra can readily infect the bladder urine from this point. There is without doubt considerable difference between the resistance to infection offered by the bladder and that offered by the posterior urethra. The posterior urethra is a favorable soil for organisms while the bladder displays enormous powers of resistance. The explanation of this lies partly in the different character of the epithelium which each possesses. It is probable that the squamous type of cell which forms the superficial layer of bladder epithelium is largely responsible for its resistance to infection. In the anatomical structure of the prostate particularly suited for harboring infection, and in the delicate cylindrical epithelium of the posterior urethra, we have a combination peculiarly favorable for the maintenance of a bacterial invasion. There is one form of bacteriuria which has been of considerable interest to us and which occurs as a complication of prostatic massage. It is usually a slight affair and yields promptly to treatment, but occasionally such a happy termination of the complication does not occur.

Case III is an unfortunate example of the rebellious character which it may assume. It is impossible to say in any one case whether the organisms travel directly through the rectal wall into the vesical cavity, or from the rectum through the lymphatics to the prostate, subsequently infecting the prostatic urethra or whether organisms already in the prostate are forced by prostatic massage into the prostatic urethra and from this point infect the urine.

In several cases in our experience in which a careful microscopic study of the strained prostatic secretion failed to reveal any organisms a bacteriuria shortly afterwards developed. Furthermore in a case of nocturnal enuresis in a boy fourteen years of age in whom there was practically no development of the prostate and no sign of inflammation, a mild cystitis developed following a light massage. It is probable in many instances that infection can come directly from the rectal mucosa, possibly the result of some injury to the mucosa or the lymphatics. Wreden (10) considers that direct penetration of bacteria through the mucous layer of the rectum can occur. His opinion is based upon a series of experiments made on male rabbits. He injured the rectal mucosa by means of an irritant or by scraping off the epithelium, and he found that the rectal lesions provoked a cystitis only when the lesion was situated at the level of the prostate or higher. Lesions lower down had no influence. The organisms found in the bladder were those usually present in the intestines. In certain instances easily recognizable bacteria were introduced into the rectum and these were subsequently recovered in the urine. When he introduced oil or vaseline, the rectum having been denuded of its epithelium, these substances were subsequently discovered in the urine. His experiments were not conclusive

as to whether the infection was through the medium of the prostate or directly from the rectum to the bladder.

Bacteriological researches of Notthafft (11), Young (12), Stevens (12) and myself (12) have shown that occasionally even when the prostatitis is primarily of gonorrhœal origin secondary invaders may be present in the prostatic secretion. It is not at all improbable that such an infected secretion when forced into the prostatic urethra may be the starting point of a bacteriuria or even cystitis. For this reason vesical irrigation following massage of the prostate is a procedure long recommended and practiced by Dr. Young. As an additional precaution the prostatic secretion should be stained and carefully studied for organisms before systematic massage is done. If secondary invaders are present the patient should be kept upon moderate doses of urotropin while under treatment.

Symptoms.—Acid bacteriuria is practically devoid of symptoms. At times there may be slight burning and frequency of urination due to irritation of the prostatic urethra, but this is seldom of any severity. There is only one thing characteristic of the condition and that is the appearance of the urine. The urine is cloudy, but the cloudiness is similar to that of a bouillon culture. No particles or definite masses are visible as in cystitis or when the turbidity is due to pus. At times it has a peculiar opalescence, no precipitate forms on standing and when centrifugalized in the ordinary way no or little sediment is formed. The usual chemical examinations disclose nothing and it is only on microscopic examination that the true nature of the urinary condition becomes evident. It is then seen that the peculiar character of the urine is due entirely to the presence of enormous numbers of bacteria. In cases of cystitis it is seldom that the fresh urine contains such a myriad of organisms as are seen in bacteriuria. In the first instance the protective forces of the body are brought into play in their fight against the invading organism inhabiting and reducing their growth while in the latter instance not being irritating to the tissues they grow luxuriantly more in the nature of saprophytes than parasites.

It is interesting that in the two cases due to the *Staphylococcus albus* the bacteriuria was alkaline and associated with the presence of large quantities of phosphates. In the third case where the *Staphylococcus albus* was associated with the *B. coli communis* the urine usually varied from a slightly acid to a slightly alkaline condition, but on standing quickly became alkaline with a deposition of a large amount of phosphates. Comparatively few observations of alkaline bacteriuria have been reported and the literature upon this point is scanty. Escat (13) has seen two cases both due to a staphylococcus, but no cultures were made. His cases are quite similar to ours, the condition had been present for years and resisted all treatment. The alkalinity is not due to an augmentation of phosphates in the urine but probably to a decomposition of the urea by the organisms with the formation of ammonium carbonate rendering the urine alkaline. This change in the reaction of the urine results in the precipitation of phosphates.

That the alkalinity of the urine was directly due to the action of the micro-organisms seems positive. In the first place the urine obtained from the kidneys was either neutral or slightly acid while the bladder urine was alkaline. Furthermore when the growth of organisms was inhibited by the large doses of urotropin the bladder urine became neutral or slightly acid.

In the Case III, where both the *Staphylococcus albus* and *B. coli communis* were present, the reaction varied. When microscopic examination showed the staphylococcus in greatest abundance the urine was alkaline while with an excess of the bacillus the urine was acid or neutral.

In all of the cases reported in the literature, due to the *B. coli communis,* the urine was always said to have been acid.

Whether the invading organism is an acidifier or an alkalinizer is of considerable importance to the patient. When the bacteriuria is an acid one symptoms may be entirely absent or at most of a mild grade, while in the alkaline bacteriuria the symptoms resulting from the passage of the phosphatic material may give rise to most distressing symptoms.

Treatment.—In most cases of bacteriuria the condition rapidly clears up with the administration of urotropin or even without the institution of any treatment. Where, however, the infection has been present for any length of time the prognosis is distinctly unfavorable. It is first essential to determine, if possible, the focus which is supplying the organisms to the urinary tract and to direct attention to the elimination of this focus.

Preyer (14) succeeded in curing some cases of rebellious bacteriuria by directing his treatment to an associated vaginitis. In cases secondary to inflammation of neighboring organs as the prostate, etc., an effort should be made to eradicate this inflammation. Irrigation of the posterior urethra, instillation of silver nitrate, dilatation and prostatic massage may be tried, and although it may not be possible to entirely eradicate the disease as in the cases which we have cited, much can be done towards decreasing the amount of infection and relieving the symptoms.

In the cases of renal origin very little can be done. Pelvic lavage may be tried. Urotropin, plenty of water and attention to the general nutrition are the measures of most value.

The results of vaccine therapy have been most discouraging. The patient's own organism has been employed in each case and the vaccine has been injected over a period sufficiently long to test its efficiency.

In conclusion we may say that:

1. Bacteriuria when persistent is always due to organisms of slight pathogenicity.

2. Bacteriuria due to the *B. coli communis* produces an acid urine. When due to the *Staphylococcus albus* it may be alkaline and give rise to a troublesome phosphaturia.

3. It is secondary to some focus in the urinary tract or neighboring organs.

4. It may persist indefinitely despite all treatment without producing any inflammatory reaction on the part of the vesical mucosa.

5. The results of vaccine therapy are entirely negative.

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CORRESPONDENCE.

BALTIMORE, November 18, 1908.

TO THE EDITOR OF THE BULLETIN OF THE JOHNS HOPKINS HOSPITAL.

Sir: In the November number of the BULLETIN there is an article by Dr. John A. West, entitled: "A Method for Complete Enucleation of the Tonsil."

The operation described as a "New Method" is very similar to one described by me in a short paper under the title, "A Simple Method of Excision of the Faucial Tonsil," which I read before the Laryngological Section of the Medical and Chirurgical Faculty of Maryland on March 22, 1907. This paper was afterwards published in the Journal of the American Medical Association, May 25, 1907, page 1761, a reprint of which I herewith enclose. Dr. West lays stress upon the difference between his operation and "any so far described"; namely, the freeing of the tonsil from the posterior pillar, as the first step in the operation.

In my reprint on page five, I make the statement that, "Should the posterior pillar be adherent, ... the knife is taken in the left hand and with the forceps in the right, the tonsil is pulled forward and outward, at the same time severing its adhesions with the pillar (Fig. 4)."

It was only necessary to call attention to this simple step because the object of this preliminary incision (when necessary) has for its purpose freeing the tonsil from its attachments to the posterior pillar in its upper half or third only, and within the supratonsillar fossa, directly under the arch, at which point the tonsil may be so deeply situated as to require delicate dissection.

The tonsil is seldom in contact with the lower half of the posterior pillar sufficiently to make a dissection from it necessary or even possible.

In the operation as described in my paper, and so nearly described by Dr. West, I claimed nothing new, except making it less difficult and complex by the use of fewer and simpler instruments.

My colleagues at the Baltimore Eye, Ear and Throat Charity Hospital, as well as other laryngologists, have been doing tonsillar excision by this method in various hospitals of this city, including the Hopkins Hospital, for the last four or five years, and very similar operations to the one under discussion have likewise been done by other surgeons for many years.

I think a writer should look well into his subject before publishing an operation as his own, which to say the least bears such a close resemblance to that of another operator. So far as I can see the only surgical difference is that I dissect entirely from above downward and Dr. West works partly from below upward, in my opinion a dangerous procedure.

There are a number of statements to which I should take exception were it my purpose to pass an opinion upon "Dr. West's Operation." However, when Dr. West tells us "I have been able to perfect a method which is different from any so far described, and which I have found to be not only entirely satisfactory, but preferable," I am obliged to enter a strong protest.

THOS. CHEW WORTHINGTON.

BALTIMORE, November 25, 1908.

TO THE EDITOR JOHNS HOPKINS HOSPITAL BULLETIN.

In reply to your query as to the similarity between the method of excision of the tonsil described by Dr. Thos. Chew Worthington in the Jour. Am. Med. Assoc. for May 25, 1907, and "A Method for Complete Enucleation of the Tonsil," which I published in the Bulletin for November, 1908, I may say we claimed only for our procedure that it "possesses two distinctive features: (1) The dissection of the tonsil *beginning at* the *posterior edge* and proceeding anteriorly. (2) The control of the hemorrhage by specially constructed clamps."

As our illustration (Fig. 1) plainly shows this *posterior dissection,* as the *first step* in our procedure, is continued to a considerable depth behind the tonsil, in some cases in fact enucleating it perhaps one-fourth from its bed in the *sinus*

tonsillaris. When the tonsil is adherent, this proeedure, of course, disseets it loose from the posterior pillar; where it lies free between the pillars, the knife in this ease passes between the tonsil and the pillar. The *object* of this *posterior dissection* is to finish the *dangerous part* of the enucleation *at the start,* before the *hemorrhage obscures the landmarks.*

On the other hand, Dr. Worthington, in his publication eited, shows us clearly how beginning by disseeting the tonsil free in the region of the superior pole, "severing the attachments to the fossa," as he describes it, he then proeeeds *anteriorly,* and he tells us, "The tonsil is then seized at a lower point, but pnlled on very lightly, while the knife is drawn firmly down its length just within the *anterior pillar.*" From his illustrations and text it is perfeetly evident that he begins his operation by *anterior* dissection. His proeedure belongs obviously among those methods whieh we in our artiele describe as "disseetion by eutting the tonsil loose from the *anterior* pillar *first,* and then proeeeding baekwards." This anterior disseetion we *never* do.

Continuing his anterior procedure the Doctor finds himself towards the end of his operation at the posterior part of the *sinus tonsillaris* (*his Fig. 4*). This posterior region, as we have emphasized, we disseet free at the start (*our Fig. 1*).

John M. West.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

November 2, 1908.

Meeting of the Johns Hopkins Hospital Medieal Soeiety, Dr. Norton presiding in the absence of Dr. Finney, president of the soeiety.

I. Report of Cases. Dr. Richardson.

Dr. C. H. Riehardson reported five gynæcological histories:

Case I.—*Bilateral Congenital Cystic Kidney. Myoma Uteri. Operation. Recovery.*

Mrs. H. (Gyn. No. 13,674), white, 44 years old, was admitted March 19, 1907, complaining of "fibroid growths on the womb."

History.—The family history was unimportant. For the past fifteen years she has suffered from shortness of breath on exertion, and for several years she had noticed some slight puffiness of the face, and œdema of the feet and ankles. She has been married 24 years, and given birth to two children, both of whom died. She has had two miscarriages. Her pregnancies, labors, and puerperia were all normal.

The onset of her present illness dates from August, 1906, at which time a period of amenorrhœa began and continued for five months. Then, at the regular time for her menstrual period, she began to bleed very profusely and had a "flooding." About the same time she noticed her abdomen becoming larger, and thought she was pregnant. In January, 1907, she consulted a physician who told her she had a fibroid tumor of the uterus. This tumor, she thought, had grown rapidly larger, but the only symptom complained of was a slight "pulling" on the right side of the abdomen.

Physical examination demonstrated that the patient was poorly nourished, with a moderate grade of anæmia, and considerable œdema ot the lower extremities. There was no heart-disease to account for the œdema. The abdomen showed a slight general fulness, a little more marked over the upper half, and no other abnormality was to be made out on observation. But in both hypochondriac regions I could feel an irregular, oblong, nodular mass projecting downwards from the costal margin a distance of about 8 cm. on the left side, and about 20 cm. on the right side. Both tumors were quite firm, and movable to a moderate degree. No connection between them could be detected. They extended well back in the flanks, occupying the position of the kidneys; the left tumor being about twice, and the right one about four times the size of a normal kidney. The kidneys could not be detected as attached to or separate from the tumors. Slight tenderness was present on deep pressure over the mesial surface of the tumor on the right side. The percussion note over both tumors was dull. Splenic dulness was normal. The dulness on the right side was not continuous with that of the liver. Both tumors descended on inspiration. A diagnosis of bilateral congenital cystic kidney was made.

The patient was seen on the following day by Dr. Kelly, who confirmed the findings already described. On pelvic examination he found a fibroid uterus in retroposition, and enlarged only to the size of a 2½ months pregnancy. On cystoscopic examination he found the bladder normal. He catheterized the right ureter, from which 15 cc. of urine flowed in two minutes, before the normal intermittent flow began. Urine from the left side was collected transvesically. Comparison of the urine from the two sides showed no noteworthy difference. Examination of the mixed 24-hour urine showed a low specific gravity (1010-1020), acid reaction, faint trace of albumin, no sugar, a few hyaline casts, no blood nor pus; urea 7 to 9 gm. to the litre. The total output varied between wide limits.

Dr. Kelly strongly advised against operation, explaining to the patient the harmless nature of the fibroid tumor so long as it did not grow rapidly and produced no symptoms. He also impressed upon her the gravity of an operation with the existing kidney condition. The patient's determination to have the uterine tumor removed at all hazards remained unchanged, and she insisted that it should be done.

Operation.—Dr. Kelly operated on March 25, resecting the uterus, with a wedge-shaped portion from its body, together with the fibroid tumor, and suspending the remainder of the organ beneath the bladder in order to support a cystocele. The pelvic floor was restored. Examination of the kidneys through the abdominal incision showed an enlarged right kidney, extending far up under the ribs, made up of multiple cysts, the largest measuring about 6 cm. in diameter. The organ was about five times normal size. The left kidney showed the same condition, and was about three times normal size. The cysts on it were all smaller and more uniformly distributed.

The patient stood the operation well. The convalescence was entirely uneventful, and she was discharged April 13, on the 20th day after her operation.

Summary.—The ehief points of interest in the ease are: First, that with bilateral eongenital eystic kidney the patient has passed safely through four pregnaneies, giving birth to two full-term ehildren, and reaehed the age of 44 without any renal symptoms, either physieal or mental. Seeond, that a small fibroid tumor of the uterus, lying wholly in the pelvis, only diseoverable on bimanual examination, and giving no symptoms, should have so impressed the patient as to prompt

her to make a long railroad journey to the hospital, and to insist upon operation against Dr. Kelly's advice. Finally, that the patient withstood a major abdominal operation as well as the average patient, in spite of the advanced disease of the kidneys. A communication from both the patient and her physician received only a few weeks ago, states that she is enjoying excellent health, is attending to all her household duties for a family of five, and suffers only from a "pressing feeling" in her right side at times.

CASE II.—*Recovery Following the Administration of Inspissated Ox Bile in a Case of Drainage of the Common Bile Duct.*

Mrs. S. (Gyn. No. 13,659), white, aged 56, was admitted on March 15, 1907, complaining of pain in the right side of the abdomen.

History.—The family history was unimportant. She has had pneumonia four times, and has undergone three major surgical operations. The first of these, eight years ago, was for a vesical calculus removed by crushing and irrigation. The second three years later, was a laparotomy for supposed appendicitis, but she was afterwards told that she had an abscess of the liver and that the appendix was not found. The third operation done here in 1904, was a left nephrotomy, with removal of a renal calculus.

The present illness began seven years ago with severe cramp-like pains in the right side of the abdomen, especially in the hypochondriac region, radiating to the right side of the back and under the shoulder blades. She had no nausea, vomiting, or fever, but thinks she had a chill. This attack was followed by a similar one three months later. Since then they have gradually become more frequent and severe; often associated with nausea and vomiting, and usually a chill, but very little fever. During the attacks the patient noticed a tender lump bulging through the upper portion of the laparotomy scar in the right hypochondrium. She thought she had been jaundiced at times after the attacks, but no history of clay-colored stools, or other positive evidence of this fact could be obtained. She had lost considerable strength and weight, and recently suffered constantly from pain in the right hypochondriac region.

Examination made on admission showed an emaciated, feeble, elderly woman, with well-marked general arterio-sclerosis, and a moderate grade of emphysema. The abdominal walls were everywhere soft and very relaxed; and there was no tenderness. A scar 16 cm. long was present in the right hypochondrium, from the upper part of which bulged a tumor about the size of a lemon, when the patient lay in the recumbent posture. The size increased on coughing, or when the patient sat up. It could not be reduced completely, and was only slightly tender on manipulation. The lower edge of the liver, the spleen, and the kidneys could not be felt. The temperature was normal; the pulse 70-80; and the leucocyte count 13,600.

The patient had a mild acute attack of abdominal pain on the day following admission. The pain was located in the right hypochondriac region; the tumor increased in size noticeably, and became quite tender. There was also slight nausea, but no chill. The temperature was only 99° F. and the pulse 84. No distension developed, nor was there any visible peristalsis. No jaundice was present, and the stools were normal in appearance. Twenty-four hours later, however, the patient developed a distinct jaundice. A diagnosis of stone in the common bile duct was made.

Operation by Dr. Kelly on March 21, 1907. He found the gall bladder slightly distended, adherent to the old scar, and contained in the hernia-sac bulging through its upper part. The gall bladder was also adherent to the stomach and small bowel. No gall stones were felt in the gall bladder, which was not opened; but one large and two small stones were removed from the common duct where they had become incarcerated, necessitating an opening of the duct for their removal. The bile looked clear and normal, and no pus was present. A drainage tube was placed in the common duct.

Post-operative Course.—Until the fifth day following the operation the patient's condition was most satisfactory; the drains had been partly removed without untoward effects. The flow of bile was very free, averaging 800 to 900 cc. in 24 hours. The jaundice had promptly cleared up, and there was no troublesome oozing of blood. On this day I noticed that the patient was a little drowsy, and seemed somewhat restless and nervous for which there seemed to be no accounting. Examination of the catheterized urine showed a distinct trace of albumin and a considerable number of leucocytes; otherwise it was negative, but the total output was only 520 cc. during the previous 24 hours. It was also discovered that the patient was using snuff freely, without our knowledge. The snuff had an odor very like opium, so that I was inclined to attribute the drowsiness to its use. Its use was at once stopped. A successful effort was made to increase the urinary output and to keep the bowels well opened.

On the seventh day, however, after a somewhat restless night, she complained of abdominal cramps and of nausea. The bowels were moving freely, and examination of the abdomen was negative. She was quite irritable at times. The temperature had never been above 100.5° F. since operation, and for the past two days had been normal. During the next three days her condition gradually became worse. She took her nourishment poorly. She was occasionally irrational, especially during the night, becoming very much excited and trying to get out of bed. She seemed very weak. The pulse was of poor quality, and the temperature subnormal. On the tenth day her condition was decidedly unsatisfactory.

The developments of the next few days necessitated free stimulation. The patient was irrational most of the time, and frequently lapsed into a profound coma from which it was difficult to rouse her. She was voiding well, and the urinary examination failed to reveal anything to account for her condition. She had frequent involuntary stools, mostly clay-colored, although some of them began to show a trace of brown, but they continued extremely foul. Her breath was sour and offensive. The sinus discharged bile very freely. The rectal temperature was subnormal, and the extremities cold. She took liquid nourishment fairly well when forced, but was usually excited and restless, with delusions of persecution when aroused. She could not retain nutritive enemata, so that by the night of the 13th day, in spite of repeated infusions, and liberal use of brandy, whiskey, and strychnia, it looked as if she would die. Believing from a careful review of her symptoms that her grave condition might be due to the lack of bile in the intestine, 4 gr. of inspissated ox gall were given to her during the night, as well as a nutritive enema which was retained. The next morning, the 14th day of her illness, her condition seemed slightly better; her temperature had risen to 99.6° F., the pulse was stronger and she took her nourishment better. The ox-gall pills were continued and from this time on her convalescence was uninterrupted and she was discharged well on the 24th day after her operation.

Comment.—Whether or not the ox gall was responsible for this patient's recovery, it is impossible to say. Certainly it was a most remarkable coincidence that her first signs of improvement began exactly at the time one would have expected effects from the administration of the ox gall. I have seen one other case, and have heard of two more, all in this hospital, following gall-bladder operations with free drainage of bile, which developed marked mental symptoms; they all three died. I submit this history with the hope that the treatment of in-

spissated ox gall may be tried in similar cases and its value determined.

Case III.—*Large Renal Calculus Producing Symptoms and Signs of Acute Appendicitis. Diagnosis Established from Cystoscopic Findings. Operation. Recovery.*

Mrs. L. (Gyn. No. 13,611), white, age 26, was admitted on February 23, 1907, complaining of pain in the right side of the abdomen and back, and of irregular menstruation.

History.—The important points in the family history were that her father died of cancer of the stomach, at the age of 49; and that one maternal uncle died of pulmonary tuberculosis.

The personal history contained several points of interest. About eight years prior to her admission she had a severe cough which persisted for several months, with considerable expectoration, on one occasion streaked with blood. For the past six years she has been entirely free from any pulmonary symptoms. She has grown quite stout in recent years. Her menses have always been irregular, recurring at intervals of two to three months, attended with severe dysmenorrhœa; the pain is located chiefly in the right lumbar and iliac regions. She has been married six years; but has had no children. One miscarriage occurred seven months after marriage at the third month of pregnancy. This was followed by chills and fever, and she was ill for five weeks, and has never been entirely well since.

The patient attributes her present illness to and dates it from the miscarriage. Since then she has suffered from irregular and scanty menstruation, with intense dysmenorrhœa; the pain of a dull-aching character constantly being located in the right iliac fossa and back. One night in March, 1906, she was awakened at 2 a. m. by an agonizing pain in the right iliac fossa, which was most intense in the region of McBurney's point. She vomited repeatedly; had fever, but no chill. The pain did not radiate. Morphia was administered by her physician; and she was confined to her bed for one week. In June, 1906, she had a second similar attack, which came on at bedtime with violent pain in the right iliac fossa, nausea, and vomiting. She noticed no blood nor anything unusual in the urine after either attack. There was no bladder disturbance. She was never jaundiced, and gave no history of clay-colored stools. Following each attack she menstruated, although her regular period happened to be due at the time of each one. She has had no further acute attacks, but has constant discomfort in the right lower abdomen and back, aggravated by jarring. A diagnosis of appendicitis was made by her physician, who had seen her in both acute attacks, and who sent her to Dr. Kelly for an appendectomy.

Examination.—The patient looked unusually robust, was large, and rather stout. The abdominal walls were quite thick. The respiratory movements were free. On gentle palpation the abdomen was everywhere soft and relaxed; on deep palpation there was definite tenderness and muscle rigidity on the right side, most marked just over McBurney's point; but there was no muscle spasm. The lower pole of the right kidney could be indistinctly felt on deep inspiration, and there was slight tenderness complained of when an attempt was made to grasp the organ on bimanual examination. The gall bladder, liver, and spleen seemed normal on palpation and percussion; and no mass nor tenderness in the abdomen was to be made out. The temperature and pulse were normal. The urine contained a few leucocytes, but was otherwise normal. The pelvic organs were normal, and the ureters were not palpable. In other respects the physical examination was negative.

A diagnosis of chronic appendicitis was made, and the patient was prepared for operation; a preliminary examination of the urine showed a few blood cells, and a large number of pus cells. These findings led to a cystoscopic examination before any operative procedures were taken.

Cystoscopic Examination.—Except for a little reddening and mammillated appearance over the trigonum, the bladder was normal. A large size wax-tipped renal catheter was then introduced into the right ureteral orifice and carried up into the pelvis of the kidney without difficulty. No urine flowed from the catheter. On injecting normal salt solution into the pelvis, 23 cc. instead of the normal 6-10 cc. were injected before any discomfort resulted. This amount, however, brought on a sharp attack of pain, which the patient promptly and voluntarily identified as identical in every respect with the pain in two acute attacks described. After detaching the syringe from the end of the catheter, there came a free flow of turbid, bloody fluid from the pelvis. On withdrawing the catheter, a tiny, dark-colored scale fell from the eyelet into the urine glass, which on microscopic examination proved to be a piece of calculus. Examination of the wax tip of the catheter showed that it was deeply gouged. The urine from the left kidney was normal. Thus a positive diagnosis of renal calculus was made.

Operation.—Dr. Kelly exposed the right kidney through the superior lumbar triangle, and removed a large calculus, filling the pelvis.

The convalescence was uninterrupted, and the patient was discharged well on March 16, after a stay in the hospital of twenty days.

Comment.—This case shows how a renal calculus may precipitate attacks exactly similar to those of acute appendicitis. Further, it illustrates the value of cystoscopy and catheterization of the ureters. Finally, it shows the great importance of careful routine examination of the urine. The discovery of an occasional red blood cell and a few scattered pus cells led to a correct diagnosis.

Case IV.—*A Large Pus Kidney Closely Resembling a Splenic Tumor. Diagnosis. Operation. Recovery.*

Mrs. J. S. (Gyn. No. 14,530), white, age 42 years, was admitted on January 25, 1908, complaining of pain in the left side of the abdomen.

History.—The family history was unimportant. The patient's general health had always been good. She had scarlet fever and diphtheria as a child and typhoid fever six years ago. Thirteen years ago she had an attack of so-called malaria, with definite shaking chills recurring every two days. This attack lasted nearly all summer, and left her with what she called "inflammation of the spleen," which has persisted ever since, and for the relief of which she came here. During the illness she noticed no swelling of the left side of the abdomen, but she suffered intense paroxysmal pain below the left costal margin, followed by nausea and vomiting, chill, fever, and sweat. The attacks occurred two to three times a week until stopped by quinine and other medicines. Since this illness she has had recurrences at varying intervals, sometimes being free from them for months. During the typhoid fever, she had a very sharp attack of pain below the left costal margin, and since then the discomfort in this region has been more constant and severe. An attack of severe pain lasts about twenty minutes, then passes off and a dull aching pain persists until relieved by anodynes. The pain does not radiate. There is marked tenderness over the left hypochondrium during an attack, and constant soreness over this region during intervals. She had never noticed any lump or swelling in the abdomen. The last attack began two weeks ago and continued up to the time of admission. She has had no urinary disturbance at any time. She has lost some weight, but could not say how much.

Examination.—The patient was well nourished and of good color, although the mucous membranes were a little pale. The thyroid gland was enlarged but there was no evidence of derange-

ment of its function. The lungs were normal. The heart showed signs of mitral insufficiency. The abdomen was slightly full over the entire left half and a firm mass could be felt emerging from beneath the costal margin, extending obliquely across the abdomen to a point 2 cm. below the level of the umbilicus and 4 cm. to its left. The mesial border reached just to the mid-clavicular line. It extended well back into the left flank. The surface of the tumor was everywhere smooth, except for a shallow transverse sulcus 2 cm. below the costal margin. The consistency was uniformly quite firm. The lower border felt rounded, as did also the anterior border, and no definite notch could be made out. It was movable only to a slight degree, and on being lifted forward with the hand posteriorly, it gave the impression, on bimanual palpation, of extending deep into the flank. Manipulation was permitted by the patient, but produced moderate discomfort. The percussion note over the mass was dull, but not flat. There was no pulsation in the tumor. The pelvic examination showed no connection between the tumor and the pelvic organs. The ureters were not palpably thickened on vaginal touch. Otherwise the abdominal organs seemed normal.

The fresh blood was negative for malarial parasites. The red corpuscles appeared normal, except a trifle pale. The hemoglobin was 76% (Sahli corrected). The leucocyte count was 6000.

On January 29, I made a cystoscopic examination and except for a slight general reddening of the trigonum, the bladder was normal. The catheterized specimen of mixed bladder urine was quite turbid. Both ureters were catheterized. Comparison of the urine from the two sides gave the following results:

Urine.	Right Kidney.	Left Kidney.
Character:	Yellow, cloudy.	Greenish, yellow, thick, purulent.
Reaction:	Alkaline.	Alkaline.
Sediment:	Small amount, gray, flocculent.	Very abundant, gray, granular.
Albumin: (heat test)	Trace.	Large amount.
Sugar:	Negative.	Negative.
Urea:	16 gm. per litre.	None.
Cultures:	————	Negative.
Smears:	Negative.	Short degenerated bacilli.
Microscopic examination:	Epithelial cells, amorphus urates, triple phosphates, hyaline casts.	Pus in large amount.

On withdrawing the renal catheters, the wax tips showed no scratches. The skiagraph also was negative. The temperature and pulse had remained normal since admission. From the above findings a diagnosis of pus kidney was made.

Operation.—An intracapsular enucleation of the entire kidney, which was converted into a pus sac, was made on February 5, by Dr. Kelly.

Convalescence.—The recovery was uneventful and the patient was discharged well on March 8.

Comment.—This case is of interest chiefly from a diagnostic point of view. The history strongly suggested malaria, and the tumor closely resembled an enlarged spleen. The probabilities are all in favor of an original pyelitis, with subsequent involvement of the kidney substance and conversion into a pus kidney. Furthermore, coupled with the previous case, it emphasizes the practical value of cystoscopy to the abdominal surgeon.

CASE V.—*An Enormous Pyosalpinx Giving the Clinical Picture of a Uterine Fibroid. Operation. Recovery.*

Mrs. A. (Gyn. No. 14,513), white, age 35, was admitted January 20, 1908, complaining of pain in the lower abdomen.

History.—The family history was negative, except that the patient's husband died two years previously of pulmonary tuberculosis.

She had one child sixteen years old, and healthy. Except for an incomplete abortion eleven years ago, attributed to a severe fall down the steps, with a subsequent instrumental removal of the placenta, her personal history was that of a healthy woman.

The present illness dates from this abortion. Following this she began to suffer with severe dysmenorrhœa, the pain being of maximum severity two days before the onset of the menstrual flow. The pain was always located in the suprapubic and left iliac regions and continued as a constant discomfort between her menses. The pain and soreness had become worse recently. Also her menstrual periods recurred at three-week intervals and were excessively free and prolonged. She had had some bladder disturbance, mainly increased frequency, and occasionally painful micturition. She had noticed no tumors or swelling of the abdomen, and had lost no weight.

Examination.—The patient was a well-nourished woman, apparently in perfect health. Aside from the abdominal and pelvic findings, nothing of consequence was discovered. On abdominal examination a noticeable fulness below the umbilicus was present, and a large pyriform tumor could be easily felt, connected with the pelvic organs, and extending upwards in the median line quite to the umbilicus and shading off on either side almost to the anterior spines, down along Poupart's ligaments, and into the pelvis. The surface of the tumor was slightly irregular, but no definite nodules could be felt. The consistency was uniformly firm and rubbery. The percussion note over the tumor was flat. On pelvic examination no evidence of infection was seen externally. The cervix was high up in the vaginal vault, normal, and seemed to be continuous with a large tumor filling the pelvis and extending up into the abdomen, as already described. On bimanual examination the tumor could be lifted as a whole from the pelvis and moved freely, but this manipulation was quite painful. I was unable to differentiate the uterus from the tumor either on vaginal or rectal examination. Nor could I palpate either ovary. The examination under ether gave no additional information. The urine was negative; and the temperature showed a slight elevation to about 99.5° F.

Operation.—On January 21, I opened the abdomen through a liberal median incision, extending from symphysis to umbilicus. A large tumor at once presented in the incision, and had the typical appearance and feel of a myomatous uterus. It lay in free contact with the omentum, coils of small bowel, and the sigmoid. But its surface was perfectly smooth and shiny, and there was no trace of an adhesion to be seen. The intestines were carefully walled off with gauze and an attempt made to deliver the tumor through the incision. I discovered that it was held by a single band of adhesions about 2 cm. in width behind and extending from its surface to the peritoneum just above the pelvic brim on the left side. I applied two curved clamps to the band and then cut between them. Unfortunately, the proximal clamp slipped off and there was a tremendous gush of thick yellow pus. I controlled the leak by pressure with my hand and applied a clamp. As the general peritoneal cavity had been carefully walled off with gauze, the soiling was confined to the pelvis. The pus was carefully sponged up, and then, owing to the partial collapse of the tumor, it was quite easy to lift it out. It was an enormous pus tube, which completely choked the pelvis, and extended as high as the umbilicus. After removing the tube it

was found that both ovaries were buried in adhesions on the posterior surfaces of the broad ligaments, and had undergone complete cystic degeneration. The right tube also was sealed off and badly diseased. The uterus was normal in size and plastered to the rectum, but the large pus tube had been so pressed down on top of it that differentiation on digital examination was impossible. The uterus and appendages were removed and, after draining liberally both above and through the vagina, the incision was closed. Cultures and smears from the pus were negative.

The convalescence was normal and the patient was discharged well on February 27. A communication received from her about two months ago stated that she was in excellent health, and felt better in every way than she had for years.

Comment.—This case demonstrates several important points. It shows to what an enormous size a pus tube may attain. It also seems extraordinary that this great sac should lie in such intimate contact with the omentum, large and small bowel, without signs of old or fresh adhesions. It shows further how closely a pus tube may simulate a myoma, not only in history and clinical findings, but even at the time of operation. Until what was probably the fimbriated end of the tube was cut through, and the pus had welled out, I thought the tumor was a myoma.

II. Cases of Brain Tumor. Dr. Harvey Cushing.

Dr. Cushing presented several cases of brain tumor. The first was a butcher, aged 29, who complained of inability to stand. The striking feature was an extraordinary, oscillatory tremor of the right hand and arm. In addition he showed a palsy of the vertical movements of the eye and no reaction of the pupils to light or accomodation. There were extreme choked discs.

The complex of symptoms resembled those of the cases reported by Gordon Holmes in *Brain,* several of which at necropsy showed a lesion in the red nucleus of the midbrain. In all of these paralysis of the eye movements in the vertical direction were constant findings, in addition to a striking tremor of one or both extremities, which persisted in varying degrees of intensity during waking hours but was absent during sleep.

The tendency to fall back in this case meant possibly involvement of the superior peduncle; the oscillatory tremor pointed to the red nucleus; and finally the ocular centers in the midbrain were involved.

The second case was a boy, 16 years old, who complained of dimness of vision. One year ago he developed petit mal which became quite severe before admission. The attacks came on with stiffening of the right hand and arm and movements of the head to the left. In many of the attacks he visualized hallucinations of scenes at home—always people playing cards. He had had severe frontal headache and vomiting. Double-choked discs were found. For a year he had been disturbed by a "swishing" or "roaring" sound in the right ear. This was heard objectively on examination—a loud bruit synchronous with the pulse and heard over the right head. A soft, tender spot of craniotabes was found in the left frontal region.

This and the petit mal suggested a left-sided growth. Diminution of the sense of smell pointed to the temporal lobe. The bruit heard over the right temporal region could be accounted for by:

1. An arterio-venous aneurysm between the carotid artery and internal jugular vein;
2. A vascular sarcoma;
3. An aneurysm of a large vessel;
4. A solid tumor indenting a large artery.

A left temporal exploration was negative although the subtemporal decompression has proven beneficial.

The third case was a man admitted in March, 1908, with headache, dizziness, and failing eyesight. There were no definite localizing signs. And a subtemporal decompression was done to relieve the choked discs. For three months he worked in comfort. He returned with swelling of the discs and signs which seemed more localizing. The ataxia and increased reflexes on the left, the swaying and tremor in the hands, pointed to a cerebellar pontine lesion on the left. However, a cerebellar exploration was negative.

The fourth case, a man of 28, complained of dimmed vision and morning headaches. He gave a history of seven months of vomiting. Three months ago suboccipital headaches, dizziness, staggering, and impaired hearing in the right ear developed. Extreme choked discs, nystagmus, and a tendency to fall to the right were noted. On suboccipital exploration a benign tumor was found and removed. Following the operation a rise of temperature over a considerable period of time occurred—such as is reported by Oppenheim and Krause.

The fifth was not a tumor case. A woman was shown who had been shot by a 22-calibre rifle, the bullet entering the right temple at the lower angle of the parietal bone. The frontal lobes were evidently injured, and she was apathetic, would not speak, and would only go through a few automatic movements. The wound was repaired, a subtemporal decompression done to allow for subsequent swelling.

In the next 24 hours, the right arm was found weak and tremors developed in the right hand. A lateral skiagraph showed the bullet not far from the cranium. In a left-sided exploration a clot was found under the dura and a wound in the cortex about at the middle genu of the pre-Rolandic area, where the bullet had struck the skull after traversing the head. Stimulation here gave movement of the hands. By estimating the angle of incidence and reflection the bullet was probed and extracted. It had gone through the frontal lobe evidently causing a pathway of local œdema which may clear up.

III. Case of Acrocyanosis following Cerebro-Spinal Meningitis. Dr. F. J. Sladen.

Dr. Sladen stated that there were not many cases of simple acrocyanosis in the literature, largely because not much attention has been paid to so simple a condition which seldom causes the patient any discomfort. It assumes importance when one realizes that it is often the first stage of erythromelalgia and the more serious conditions. This and the fact that the etiology is not often so clear justified the presentation of this case.

The patient was a school-boy, 15 years old, whose first admission to the medical clinic was in May of this year. He was

brought in on the second day of an attack of acute epidemic cerebro-spinal meningitis. Twenty-four hours after the first intraspinal injection of 30 cc. of anti-meningitis serum (Flexner) the spinal fluid was sterile and the delirium, headache, and pain in the neck had disappeared. A second injection of 15 cc. caused the temperature to fall by crisis from 104° F. to normal in twenty-four hours. As is characteristic the stiff neck and positive Kernig sign persisted several days. He had no complications and was discharged on the twentieth day in good condition. His heart and lungs were negative. And no cyanosis of the extremities was noted during admission or on discharge.

Two and a half months after discharge he returned, complaining of a general pruritus of twenty-four hours' duration. He was obstinately constipated and the pruritus cleared up with purging and dieting. He himself had noticed the red color of his hands a few days previously. His hands and feet have remained bluish-red and congested. His lips and ears were also somewhat cyanotic. No cause for the cyanosis was discoverable in the physical examination. The blood picture was normal. There were no disturbances of sensation and no trophic changes. The attempt to produce red, white, and blue fingers by immersion in hot and cold water was unsuccessful. Apparently the condition is simple acrocyanosis with the cerebro-spinal meningitis as the probable etiology.

Dr. Sladen mentioned the possibility of showing the boy later as a case of erythromelalgia or at any rate a more complex neurosis of which this acrocyanosis is the first stage. In fact, already, a month and a half after the discovery of the acrocyanosis, the boy stated that the dependent position of his hands was uncomfortable and that the cold weather made some of his fingers very blue. No syncope had been evident, however, and no definite pain.

IV. The Axillary Diastolic Murmur in Aortic Insufficiency. DR. R. COLE and MR. A. B. CECIL.

This paper was published in the December number of the JOHNS HOPKINS HOSPITAL BULLETIN.

November 16, 1908.

The meeting was opened with the election of Dr. Frank R. Smith as president and Dr. Rufus I. Cole as secretary of the society for the ensuing year. In the absence of Dr. Smith, Dr. T. S. Cullen occupied the chair.

I. Fever. DR. W. G. MACCALLUM.

Dr. MacCallum stated that normally in mammals and birds an elevated body temperature is maintained with but slight fluctuations from a constant level. This constancy results from the fact that in spite of great variations in the amount of heat produced the dissipation of heat is so regulated as to bring about the retention of just enough to keep the body at or near the normal temperature. In fever there is a moderate increase in heat production but the elevation of temperature is perhaps chiefly due to changes in the action of the heat-regulating mechanism.

Heat production is almost entirely dependent on processes of oxidation, the measurement of which shows a moderate increase over the normal during fever—an increase which corresponds with the measured increase in heat production. There are, however, very marked qualitative changes in the metabolism during fever. The increased katabolism is due prineipally to the destruction of proteid, and not merely the circulating proteid but that of the tissues. Fat is also consumed rapidly from the tissues, and the oxidation of carbohydrates goes on quickly until all or most of the stored carbohydrate is consumed. The changes in water and mineral salt metabolism are even yet somewhat obscure and seem to be variable. The striking feature remains the excessive decomposition and excretion of proteids.

There is much evidence to show that all these disturbances in heat regulation and metabolism constitute the mechanism or are the indications of the progress of a protective reaction designed to combat the infection. It is probable that this consists in the formation of immunizing or protective substances in the elaboration of which much tissue proteid is used up and a temperature is required higher than the usual body temperature. This requires time and the reaction is almost useless against a sudden, overwhelming dose of the poison or infectious agent. But as Rolly and Meltzer have recently shown, the production of agglutinins and bacteriolytic substances is accelerated and intensified by high bodily temperature.

Fever should therefore not be looked upon as an unmixed evil—even if in itself it does some harm, it is probable that that is because of its imperfection as a mechanism, which otherwise has as its aim the protection of the body against the advance of an infectious or toxic disease.

DISCUSSION.

DR. BARKER.—The phenomena commonly before us are often the least understood. Consider consciousness and sleep. How little is known about them! The purposefulness of fever as emphasized by Dr. MacCallum is gratifying. It is important therefore not to interfere—to combat it only when it is in great excess. Compare our recent ideas of arterial hypertension.

I should like to ask Dr. MacCallum about the retention of salts in pneumonia and their excessive excretion in other febrile paroxysms. Has he found a satisfactory explanation of this?

DR. MACCALLUM, in response.—As to the salt output in malaria, it is increased during the fever. There are numerous fantastic explanations, all unsatisfactory. Rem Picci believes the salt is produced by the breaking down of red blood corpuscles. The output is far greater in amount, however, than this could produce.

The explanations of the retention in pneumonia are similarly unsatisfactory. The best is that the salt is retained to maintain the isotonicity of the body fluids. But too much is retained, to accomplish this and even excessive amounts of salt taken by the mouth may fail to reappear.

II. Some New Illustrations of Aural Anatomy. DR. H. O. REIK.

A demonstration with the epidiaseope of drawings by Messrs. E. A. Morrison and Kensey Toda.

NOTES AND NEWS.

Dr. John Auer is Associate of the Rockefeller Institute for Medical Research. Address: 13 W. 121 Street, New York City.

Dr. John M. Berry is Consulting Surgeon to the Leonard Hospital and Orthopedist to the Samaritan Hospital, Troy, N. Y. His address is The Caldwell, Troy, N. Y.

Dr. E. Bates Block has recently purchased the Piedmont Sanitarium, Ga.. for medical, nervous and mental diseases.

Dr. Charles H. Bunting is Professor of Pathology, University of Wisconsin. Address: 1930 Monroe, Madison, Wis.

Dr. J. I. Butler is Assistant Surgeon to the Springfield Hospital, and Assistant Surgeon, House of Mercy. Address: 26 Maple Street, Springfield, Mass.

Dr. Benson A. Cohoe resides at 124 Western Avenue, West Toronto, Canada.

Dr. Ernest S. Cross has been Resident Physician to the Telfair Hospital, Savannah, Ga., during 1908.

Dr. Ernest C. Dickson is Assistant in Pathology and Bacteriology, Cooper Medical College, San Francisco, Cal.

Dr. S. A. Dodds is Pathologist to the Whitehead-Stokes Sanitarium, Salisbury, N. C.

Dr. Charles P. Emerson is Superintendent of the Clifton Springs Sanitarium, Clifton Springs, N. Y.

Dr. R. H. Follis is Associate in Surgery, The Johns Hopkins Hospital.

Dr. Henry Harris is Instructor of Principles and Practice of Medicine, Cooper Medical College; Visiting Physician to the California Women's Hospital; Visiting Physician to the Pacific Hebrew Orphan Asylum; Consulting Physician to Mt. Zion Hospital, and Chief Examiner of Columbia National Life Insurance Company. Address: 1204 Sutter Street, San Francisco, Cal.

Dr. C. W. Hennington resides at 303 Alexander Street, Rochester, N. Y.

Dr. Henry T. Hutchins is Assistant Out-Patient Surgeon and Resident Pathologist to the Free Hospital for Women, Brookline, Mass. Address: 483 Beacon Street, Boston.

Dr. Irving P. Lyon is Lecturer in Clinical Medicine and Librarian, Medical Department, University of Buffalo. Address: 531 Franklin Street, Buffalo, N. Y.

Dr. William G. MacCallum is Professor of Pathological Physiology and Lecturer on Forensic Medicine, The Johns Hopkins University.

Dr. Harry T. Marshall is Professor of Pathology, University of Virginia. Address: Charlottesville, Va.

Dr. E. M. Mason is State Pathologist, Alabama, and Pathologist to St. Margaret's Hospital. Address: 815 First National Bank Bldg., Montgomery, Ala.

Dr. Charles C. Norris is Instructor in Gynecology, University of Pennsylvania, Attending Physician to the Philadelphia Maternity Hospital, Assistant Gynecologist and Obstetrician to the Philadelphia General Hospital, Assistant Gynecologist, St. Vincent's Home, and Chief of Dispensary, Howard Hospital (Gynecology).

Dr. Charles D. Parfitt has been appointed Resident Consultant to the institutions of the National Sanitarium Association—the Muskoka Cottage Sanitarium and the Muskoka Free Hospital for Consumptives, Gravenhurst, Ontario.

Dr. William O. Pauli resides at 2915 Vine Street, North Cincinnati, Ohio.

Dr. Stephen Rushmore is Gynecologist to the Carnegie Hospital, Boston. Address: 483 Beacon Street, Boston, Mass.

Dr. J. Alison Scott is Adjunct Professor of Clinical Medicine. University of Pennsylvania, and Attending Physician to the Pennsylvania Hospital. Address: 1834 Pine Street, Philadelphia, Pa.

Dr. Charles N. Spratt is Clinical Instructor in Ophthalmology and Otology, University of Minnesota. Address: 305-310 Syndicate Arcade, Minneapolis, Minn.

Dr. Harvey B. Stone is Adjunct Professor of Surgery and Gynecology, the University of Virginia; Assistant Surgeon, the University of Virginia Hospital, and Director, the University of Virginia Dispensary. Address: Charlottesville, Va.

Dr. S. Strouse is Physician to The Hebrew Hospital Dispensary, and Visiting Physician to the Jewish Hospital for Consumptives, Baltimore. Address: 1704 Eutaw Place.

Dr. J. M. Taylor is Lecturer on Gynecology to the Nurses at St. Luke's Hospital Training School, Boise, Idaho.

Dr. Martin B. Tinker is Associate Professor of Surgery, Cornell University Medical College, Ithaca, N. Y., and Surgeon to the Clifton Springs Sanitarium, Clifton Springs, N. Y.

Dr. J. H. J. Upham is Professor of Medicine, Starling-Ohio Medical College, Visiting Physician to St. Francis Hospital, Consulting Physician of the Ohio State Penitentiary and Secretary of the Ohio State Medical Association. Address: Columbus, O.

Dr. Douglas Vanderhoof is Adjunct in Medicine and Lecturer on Physical Diagnosis in the Medical College of Virginia. Address: 603 East Grace Street, Richmond, Va.

Dr. Louis M. Warfield is Lecturer in Clinical Microscopy and Instructor in Medicine, Medical Department of Washington University; Physician to the Protestant Hospital, and Adjunct Attending Physician to the Martha Parsons Free Hospital for Children. Address: Metropolitan Building, St. Louis, Mo.

Dr. Harry I. Wiel's address is 519-520 Butler Building, San Francisco, Cal.

Dr. Otis B. Wight's address is 903 Corbett Building, Portland, Oregon.

Dr. J. Whitridge Williams, in addition to his positions on the Johns Hopkins Hospital Staff, is Gynecologist to the Union Protestant Infirmary, and Medical Adviser to St. Agnes Hospital, Baltimore

Dr. Paul G. Woolley is Associate Professor of Pathological Anatomy in the University of Nebraska College of Medicine, Omaha, Neb.

Dr. Hugh H. Young is Associate in Surgery to the Johns Hopkins Hospital.

INDEX TO VOLUMES 1-16 OF BULLETIN.

A subject and author index of the first sixteen volumes of the Johns Hopkins Hospital Bulletin is now ready. As the edition will be limited, it is desirable that orders be sent in as promptly as possible.

Price bound in cloth is fifty cents.

Orders should be addressed to the Johns Hopkins Press, Baltimore, Md.

NOTES ON NEW BOOKS.

State Commission in Lunacy, Nineteenth Annual Report, October 1, 1906, to September 30, 1907. ALBERT WARREN FERRIS, M. D., SHELDON T. VIELE, WILLIAM L. PARKHURST, Commissioners; T. E. MCGARR, Secretary. Transmitted to the Legislature, January 31, 1908. (*Albany: J. B. Lyon Company, State Printers, 1908.*)

This formidable volume of upwards of 1300 pages gives an interesting account of what New York has done for the care of her dependent insane during the past year. It contains the report of the State Commission in Lunacy proper with many accompanying documents, such as the formal annual reports of the State institutions under the charge of the commission with comparative statistics, verbatim reports of the proceedings at the quarterly meetings at Albany of the superintendents of institutions, the report of the director of the Pathological Institute, statistics as to the criminal insane, and detailed accounts of the visits of the committees of the State Charities Aid Association. It is evident that the work of the Commission in Lunacy of New York is no longer tentative and experimental, but has reached a definite stage of permanence with a settled policy and enduring traditions. It, therefore, seems not worth while for the reviewer to consider the abstract question as to the wisdom of a commission in lunacy with broad powers, but rather to inquire as to the character and value of the work which is accomplished. A careful reading of the volume under consideration must impress one with the conviction that the dependent insane of New York are to-day in much better condition than ever before in the history of the State. They are all gathered into organized hospitals under the care of trained experts for whose further training the State is constantly furnishing increased facilities; they are nursed and watched over to a greater degree each year by educated nurses; they have more varied means of occupation and better therapeutic resources; the institutions have become standardized and each one compares most favorably with the other; in other words, all the institutions of the State have been placed upon a higher plane of efficiency. Even if, as some critics declare, there is less individual initiative on the part of superintendents of hospitals under the Commission than formerly, there seems now a higher standard of general accomplishment, the credit for which must be given to the Commission.

The verbatim reports of the quarterly meetings at Albany indicate how widely the process of standardizing the hospitals has contributed to the education of their medical officers. In the volume there are papers and elaborate discussions upon subjects of vital interest as the "care of dotards in public hospitals," the "training of nurses," the "open-air treatment of insanity," the "care of the insane pending commitment," the "occupation and diversion of patients," and "the best method of increasing the usefulness of the annual report." The papers which presented these varied topics were painstakingly and conscientiously prepared and the discussions were of great value. The "care of dotards" seemed to present the most difficulties and the conclusions reached were not wholly clear. The latitude which prevailed in practice as to the method of dealing with dotards in the different institutions showed a spirit of liberality on the part of the Commission in Lunacy and a desire that each superintendent should be free to decide the question of admitting or rejecting them. The discussion of the statistical tables in the annual reports presented many valuable suggestions. It is evident, however, that no real progress can be made in determining the curability of insanity until such tables deal with persons and not with cases. If in these tables each person had his own number which designated and identified him in all subsequent admissions it would be possible to know what the ultimate termination of his disease was, no matter under what varying forms of apparent disease he might have entered the hospital.

It is most gratifying to perceive how highly the work of Dr. Adolf Meyer in promoting the training of medical officers in these hospitals is appreciated by reading the hearty encomiums which are paid him by his associates. It is matter of regret that space will not permit any adequate abstract of the contents of this bulky volume. All who are engaged in the treatment of the dependent insane should read and profit by it. The great bulk of the volume, however, renders it a difficult book to consult. A more detailed index would also be a convenience for the reader.

Modern Medicine. Its Theory and Practice, in Original Contributions by American and Foreign Authors. Vol. IV. Edited by WILLIAM OSLER, M. D., assisted by THOMAS MCCRAE, M. D. (*Philadelphia and New York: Lea and Febiger, 1908.*)

This volume, containing the articles upon diseases of the circulation, the blood, the spleen, thymus, and ductless glands, maintains the standard set by its predecessors. As might be expected from a list of contributors which numbers Doctors Abbott, Babcock, Blumer, Cabot, A. G. Gibson, Hoover, Lyon, McPhedran, Osler, Pratt, and Warthin, the articles are scholarly, and the literature dealt with by the writers is brought well up to date. The articles by Professor Osler—endocarditis, valvular heart diseases, and diseases of the arteries—written in his inimitable style, need no further comment. The notes upon pathological physiology by Dr. A. G. Gibson, though rather brief, constitute a feature which is not often found in works of this type, and form a valuable addition. The chapter by Dr. Maude Abbott on the congenital heart diseases is unusually complete; it is particularly striking from the presence of a number of illustrations, a feature which might have well been introduced in the other articles also.

The articles upon hæmatology and the ductless glands are concise and readable, although some notable omissions occur. For example, in the article on the treatment of leukæmia Dr. Cabot does not even mention the use of arsenic, confining himself entirely to the use of the X-rays which he seems to regard as almost specific. It is impossible to dwell at length upon the other articles, but they may be said to share the general excellence of those which have been referred to above.

Fourth Annual Report of the Henry Phipps Institute. For the Study, Treatment, and Prevention of Tuberculosis. Edited by JOSEPH WALSH, A. M., M. D. (*Philadelphia: Henry Phipps Institute, 1908.*)

The Fourth Annual Report of the Henry Phipps Institute consists, as have the three previous volumes, of statistical studies. An unusual amount of time and labor is spent in the making, the keeping, and the analysis of their exhaustive records. These are their pride, and only the initiated may assist in their preparation. Every effort is made to have the entries uniform and no labor spared in the checking and control of observations. Under such fostering care a staff of physicians has developed skilled in the taking of records and the results of their labor is the monument to which the Phipps Institute points after its four years of existence. In the present report are considered in great detail and with unusual care the varying features of 3733 cases of tuberculosis. The color, the race, the sex, the social condition, the height, the weight, the complexion, the color of eyes, the age, occupation, habits, economic condition, etc., etc., are arranged in tabular form and subjected to critical review. A splendid array of figures it is and one in search of statistics upon any feature bearing on tuberculosis will find a satisfactory account of it in this volume. The figures relating to the disease of the circulatory system are, how-

ever, very remarkable. In 2274 cases of pulmonary tuberculosis there were 18 cases of aortic stenosis, 7 of aortic insufficiency, 20 of mitral stenosis, 66 of mitral regurgitation, and 10 more cases with combined lesions. In other words, something over 5 per cent of the cases are affected with valvular heart disease. Most of the cases have mitral disease, and there is no evidence to show that patients with mitral disease are especially prone to tuberculosis. Indeed, some prominent clinicians have and do contend that they are relatively seldom attacked. For 5 per cent of any group of cases to display valyular disease of the heart is an anomalous feature, and one is forced to presume that the standards of diagnosis at the Phipps Institute are different from those which commonly obtain. It is merely suggested as a possibility that auscultatory phenomena have been given too much importance, and it is commonly known how very unreliable auscultation alone is in the diagnosis of valvular lesion. We would remark particularly that nearly 1 per cent of the cases have aortic stenosis and then comment with Broadbent how very rare true aortic stenosis is. This table certainly needs elucidation.

The other articles in the volume are reports from the various departments, and more detailed studies of special cases and of special organs as of the blood, the urine, bones and joints, lymph glands and skin, pleura, etc. It remains a regret of all interested in tuberculosis who look forward to the appearance of these reports that little or no experimental work is attempted. We know under what disadvantages the Phipps Institute is at present laboring, and we hope that conditions will soon improve so that the laboratory reports may occupy the place they should have in conjunction with the clinical work.

Thomas Linacre. By William Osler, M. D., F. R. S. (*Cambridge: University Press, 1908.*)

With the happy translation—as Dr. Osler terms it, and doubtless one whose name begins with a "Mac" would so consider it to go from an English to a Scotch university—of Donald Macalister from Cambridge to Glasgow University it was decided that the Linacre lectureship at Cambridge University, which had been held by him, should be changed to an annual lecture to be known as the Linacre lecture. It was a happy thought to invite the Regius Professor of Medicine at Oxford to deliver the first lecture, both because there are foundations established by Linacre at Oxford and at Cambridge, and because the lecturer has been for many years especially interested in Thomas Linacre. Very fitly he chose as the subject a review of the life and works of the founder of the lectureship. The main points in Linacre's life and the factors which influenced him are discussed; and it is pointed out that he was one of the first of the English students who went to Padua for his medical education. Of the influence of Linacre on the revival of learning in England, of the importance of his works, both as a physician and grammarian, Dr. Osler has given a delightful description. Interested in medicine throughout his life he found many other things in which to work, and as has been pointed out, Linacre is perhaps the original of the character in Browning's poem, "The Grammarian's Funeral." Perhaps the chapter on Linacre as a grammarian is the most interesting part of the work. The last chapter of the book gives an account of the Linacre foundations, their history and some notes of the principal men who have held the lectureships. It is rather a surprise to find among them the name of Matthew Prior, although there were several occasions when it was not possible to have the lectureship at Cambridge held by a medical man. The lecturer pays a graceful tribute to Donald Macalister in expressing the view that he could have undertaken the work of any of his fifty predecessors with a light heart. Those of us who know the present principal of Glasgow University will cordially agree with that. Doctor Osler points out that on the whole the Linacre foundations flourished better at Cambridge than at Oxford. There are reproductions of the portraits of Linacre and the title pages of a number of his works.

Altogether we have to thank Doctor Osler for giving us, in his own delightful style, another bit of medical history and the account of an important figure in the advance of learning in England.

The Law in General Practice. Some Chapters in Every-day Forensic Medicine. By Stanley B. Atkinson, M. A., M. B., *etc.* (*London: Henry Frowde*, and *Hodder and Stoughton, 1908.*) *Oxford Medical Publications.*

This book is better adapted for the English than the American practitioner, and will, therefore, find but a limited sale in this country. Medical law differs so greatly in many respects in the States from in Great Britain that a study of this work from the legal standpoint would not be very helpful to a doctor in this country. However, there is much advice in this treatise which would be useful to any member of the medical profession. The style of the author, like that of most legal writers, is rather dry to the ordinary reader, and some points are not made as clear as would be well to those ignorant of legal procedure. The following remark is distasteful: "It is not an uncommon pleasantry in operating theaters to feign to have forgotten which side of the patient had to be treated" (p. 118); as is also the term "wedding-ringless" (p. 146). It is a distinct pity that "brain-storm" (p. 173) should have crept into a serious work. It is doubtful whether indecent exposure is usually the result of "reflex acts of a desire to relieve an overful urinary bladder" (p. 172). The following division of insane patients whom a doctor is likely to be called upon to send to some institution is unsatisfactory: (1) those found wandering; (2) those who exhibit dangerous mental symptoms in their own homes; (3) the well-to-do insane (p. 182). More exact knowledge in science can hardly be said to narrow men's views, "for men's views narrow with progress of the 'scopes'" (p. 223); theories may be altered and dropped, but all true knowledge enlarges our abilities to look further ahead. 'Scopes' is a word for which there is no excuse, except in the language of the uneducated. "'Expectancy of life' is mostly the clever conjecture of actuaries" (p. 227). This is a too slurring remark. The statement that "the presence of gonorrhœa cannot be established by microscopical evidence" is not readily intelligible, unless the author means established as convicting evidence in court, but in any case it needs further explanation. In spite of this criticism of certain aspects of the work, it is one that is worthy of a place in a medical library. R. N.

Manuel des Gardes-Malades dans les Hôpitaux pour Maladies Mentales. Par M. le Dr. Jules Mord, Médecin-Directeur de l'Asile d'Aliénées de l'Etat Mons. (*Bruges: Houdmont-Bricin et Fils, 1907.*)

This excellent little manual should be translated into English for the use of nurses who desire to care for the insane. There is much in it which is applicable to nurses of other classes of patients, but this rather increases than detracts from its value as a nursing manual. It is a small volume of about 200 pages, clearly and sympathetically written by a doctor who recognizes what is most important in the care of the insane. Not alone in America are distinct advances being made in the art of nursing, but abroad as well, and one of the best signs of the time is the evidence that the Catholic sisterhoods are recognizing the necessity of training their members in as equally proficient ways as are lay nurses in Protestant schools. It is worthy of remark that the Superioress of the Sisters of Charity paid the printing expenses of copies of this manual for the Sisters engaged in nursing the insane in their asylums, and her act was one of generosity

and intelligent recognition not only of the needs of the Sisters, but also of their patients. Fortunately for both, no better book could have been selected for this wide work, and the author may well feel an honest pride in having written a treatise which will doubtless bring more relief to a large body of sufferers than all the other methods of relief employed in trying to cure them.

R. N.

Methodus Medendi. A Sketch of the Development of Therapeutics. By SIR WILLIAM HENRY ALLCHIN. (*London: H. K. Lewis, 1908.*)

In this work, reprinted from the Medical Magazine, Sir William Henry Allchin has given a most interesting sketch of the history of the treatment of disease, beginning with a discussion of the methods employed in antiquity, many of them based on superstition. He then passes to a discussion of empirical methods and treatment by drugs. The third section considers the rational treatment of disease and scientific therapeutics. It is not possible to review this work in any detail because there are so many interesting references that it would be difficult to choose any part for special comment. The writer has consulted a large number of works from which he has chosen many illuminating quotations; thus we find him taking toll from such divers authors as Robert Burton and Herbert Spencer. Consideration of the number of remedies which have been employed even in comparatively recent times tends to give one a spirit of therapeutic humility and thankfulness. Thus there is an interesting note of a preparation in the London Pharmacopœia for 1639, known as *Antidotus magna Matthioli adversus venena et pestem*, which contained 130 ingredients, some of them being compounds.

Altogether this is a monograph which may be cordially recommended to all who have any interest in the history of medicine. We should like to thank the author for the pleasure his work has given us and for the amount of information and the number of side-lights on the progress of therapeutics which he has gathered together.

Sprue and Its Treatment. By W. CARNEGIE BROWN, M. D., M. R. C. P. Price, 6 shillings. (*London: John Bale, Sons & Danielsson, 1908.*)

What chance Doctor Brown has had for the study of this disease is not evident, so that it is impossible to decide whether the book is the result of personal experience in the observation of cases in the East, or merely a compilation of the work of others. As it is a disease only seen by chance in England, such a work can at best be based on the study of a very few cases, if the author has not lived in the East, and, therefore, its importance as an original contribution, is limited. The "Treatment" occupies more than half the volume, and it is with the purpose of making the "treatment" the "object of this contribution" that so much space is given to it. It must be left to our confrères where sprue prevails to pass on the merits of the treatment advocated. The author has written his treatise in a clear style, with abundant reference to authorities, so that doubtless the book will be serviceable to practitioners in the East.

Progressive Medicine, Vol. III, September, 1908. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by HOBART AMORY HARE, M. D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College of Philadelphia. Octavo, 285 pages, with 30 engravings. Per annum, in four cloth-bound volumes, $9.00; in paper binding, $6.00, carriage paid to any address. (*Philadelphia and New York: Lea & Febiger.*)

The volume contains chapters on "Diseases of the Thorax and its Viscera," by Ewart; on "Dermatology and Syphilis," by Gottheil; on "Obstetrics," by Davis, and on "Diseases of the Nervous System," by Spiller. It is furnished with an index. The authors are all men well known for their work along these special lines, so that each review may be considered to cover well the branch dealt with, and to do it in a righteously conservative manner. It is no easy task to co-ordinate all the literature which appears in the course of a few months on any leading medical subject, and the success of this publication is largely due to the skill which is shown by the contributors in abstracting the more important papers, and presenting a clear résumé of the topic in question. No student will fall far behind the times if he reads these volumes carefully, and takes the trouble to look up some of the original articles referred to, for after all one must refer to the sources, if one wants to be thorough in one's knowledge. "Progressive Medicine" is more than a reference handbook, and for many invaluable.

The Pancreas: Its Surgery and Pathology. By A. W. MAYO ROBSON, D. Sc. (Leeds), F. R. C. S. (Eng.) of London, and P. J. CAMMIDGE, M. D. (Eng.) D. P. H. (Camb.), of London. Octavo volume of 546 pages, fully illustrated. Cost, $5.00 net. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

This is one of the most important recent works on the pancreas. The chapter on the comparative anatomy of that organ is very interesting, and that on its anatomy is very full. Then brief mention is made of the embryology of the pancreas. Chapter IV on "Anatomical Abnormalities" is especially good. Chapter V on "Surgical Anatomy" is rather disappointing, but that on histology is better. The chapter on the physiology of the gland seems very complete, that on pathology is fair, that on chemical pathology seems especially complete. Of course, in this last the pancreatic reaction receives very full treatment. The chapter on diabetes seems to be a review of literature with frequent mention of the writer's experience. Then follow 200 pages in which are discussed the symptomatology, diagnosis, and treatment of the various diseases of the pancreas with especial reference to their surgical treatment.

The book is a large one, the subjects are rather voluminously treated, the cuts are only fair, the printing is good. One misses a certain conciseness of statement, a critical treatment of the cases mentioned and the literature quoted. One wonders if the importance attached to the pancreatic reaction is in any way a standard of the accuracy of statement concerning other pathological and chemical work reported. As a review of recent literature, the book is a valuable aid to students of this subject.

The Writings of Sir William Broadbent. Edited by WALTER BROADBENT, M. D., M. R. C. P. (*London: Henry Frowde*, and *Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

This is a volume containing only a "selection" of Sir William Broadbent's medical writings, but one full of meat and worthy of a prominent place on the book-shelves of any doctor. The writer was for many years one of London's most highly-esteemed and successful practitioners, and in these papers one finds what one is ever in search for, the results of a broad experience, and the learning of a wise man. Here are set forth the author's views on many features of heart, lung, and kidney diseases, as well as on treatment of various troubles, and there is a long series of papers on neurological subjects. As Broadbent wrote no comprehensive treatise of medicine, this collection of his articles is both interesting and valuable; and it is fortunate for the profession that his son has edited them. The English clinicians surpass all others in their ability to present old subjects in a clear and fresh manner, and always succeed in giving vivid pictures in relating case-histories. This ability is manifest in Sir William Broadbent's writings; each paper, though oftentimes brief, is complete in

itself, and is delightful reading. There is ever the feeling in reading them that the author was perfect master of his subject. The following quotation (p. 301) is well worth pondering over: "We are all a little like the profane Yankee who acknowledged that man was a smart piece of work, but thought that if he had been present at the making of him, he could have suggested a 'wrinkle or two.' A distinguished medical authority would make him without tonsils, and a great anatomist thinks the vermiform appendix a useless source of danger. I will not in like manner impute clumsiness to Nature in requiring a different tract and apparatus for each modification of sensation; *I think it is the interpretation which is clumsy*" (the italics are the reviewer's). This was written as long ago as 1876, and the same misinterpretations of Nature are prevalent to-day. R. N.

The Ready Referenee Handbook of Diseases of the Skin. By George Thomas Jackson, M. D. Sixth edition, revised. 737 pages. (*New York: Lea & Febiger, 1908.*)

This new edition shows 60 pages, 8 illustrations, and one colored plate, together with some change of the text, added to the last edition.

The new articles include black tongue, dermatitis verrucosa or vegetans, keratosis follicularis contagiosa, keratosis senilis, lichen obtusus, melung, pseudopelade, and sportotrichosis hypodermica.

The diseases of the skin are still arrauged in alphabetical order. At least one error of omission shows some carelessnes of the proofreader, and makes necessary a reference to the appendix. After referring the reader several times to leucodermia, one looks for it in vain under the alphabetical list.

The illustrations are only fair.

Russell Sage Foundation. The Campaign against Tuberculosis in the United States. Price, $1.00. (*New York: Charities Publication Committee, 1908.*)

This most useful publication is practically a directory of all institutions dealing with tuberculosis in the United States and Canada; of course, private institutions of an undesirable character are omitted. The sanatoria are arranged in alphabetical order of the States, so that it is easy to see just what means for fighting tuberculosis exist in any State; then come similarly-arranged lists of hospitals for the iusane and penal institutions making special provisiou for their tuberculous patients and inmates, followed by the dispensaries and clinics for the special treatment of tuberculosis, the tuberculosis classes in the United States, and associations and committees for the study and prevention of tuberculosis in the United States and Canada. In addition to these lists there have been included in the volume typical forms of the organizatiou (constitution and by-laws) of associations in the United States, and the legislation affecting tuberculosis in the United States, including an outline of the activities of State and local boards of health. This mass of information which has been compiled by Mr. Philip P. Jacobs, under the direction of The National Association for the Study and Prevention of Tuberculosis, is of incalculable service to all seriously interested in the campaign agaiust this disease. It is a pity that it did not appear in time to be presented as a document at the International Congress on Tuberculosis which has just met in Washington. The compilation of such statistics is a worthy use of the "Foundation," as it is of distinct social service. It is certain that the book will be widely welcomed.

Biennial Report of the Board of Health of the City of New Orleans, 1906-1907. (*New Orleans: Brandao Printing Company, 1908.*)

The work done by the Board of Health of New Orleans is satisfactory and as good as that done iu many of our larger cities. The necessary work that has yet to be done can only be accomplished with the help of the medical profession and that of the public. That more rapid progress in sanitation is not made is largely due to the oppositon of the doctors, who, as a body, must be held responsible for the slowness of our progress in these matters. Measles is not classified as one of the diseases in New Orleans that must be reported to the Board of Health, and for this reason the mortality rates are higher there than they ought to be. Were the doctors eager that measles should be reported, it would soon be done, and the city would thereby benefit. The help of the citizens is to be secured through the instruction they receive by the leading members of the profession, but if the doctors are indifferent and negligent in their duties, it is clearly not to be wondered at that the citizens alone do not take the necessary steps to improve matters. On the other hand, too stringent laws on the part of the Board of Health will arouse much antagonism, and it is not plain why in all cases of infectious diseases "public or church funerals are forbidden," since if proper precautions are taken, there could be no possibility of spreading the disease, from which the patient died, by such religious services.

The following paragraph from the report (p. 68) suggests that the Board of Health did not fully realize its responsibilities. It is stated that "in the cause of a discussion touching the advisability of creating a milk commission for the bacterial count of milk and the grading and certification of special milk and dairies, the startling fact was brought out that Boston, with its bacterial count, has an infant mortality higher than that of New Orleans since 1900." This certainly does not disprove the value of bacterial counts, and such meager comparative statistics are worthless. No one, who can reason for himself, can fail to recognize that milk with few bacteria is a better food to drink than milk polluted by mauy disease-produciug organisms.

In other respects the report is deserving of commendation.

R. N.

Pain: Its Causation and Diagnostic Signifieance in Internal Diseases. By Dr. Rudolph Schmidt. Translated and edited by Karl M. Vogel, M. D., and Hans Zinsser, A. M., M. D. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

In bedside diagnosis the patient's symptoms are of the greatest importance and likewise cause the greatest difficulty in interpretation. Of all subjective symptoms, pain is the most common and the most complex in its manifestations. The patient's interpretation of his symptoms, which depends so much on his individual reaction, necessarily influences the physician in studying the underlying condition, aud consequently there is probably nothing in medical practice which causes more divergence of opinion than the diagnosis of the cause of pain.

The book uuder review aims to assist in this analysis and is a most thorough presentation of a diffcult subject. The first four chapters, which iu certain respects are the most valuable in the book, deal entirely with the necessity of systematic study of painful seusations, especially with regard to topography, time, intensity, quality, simulation, modifying factors, and all accompauying manifestations. The discussion of modifying factors is of great importance and is well presented. The thoroughness of the book is well seen in the study of headaches, to which 15 pages are devoted. The nervous system, the organs of motion, the digestive tract, the cardio-respiratory and urinary system all receive careful attention. Of special interest are the discussions of pain in gastric ulcer and in appendicitis. Throughout the whole book the author attempts to reveal the underlying anatomical and physiological basis of pain. The book closes with an extra chapter added by the American translators, dealing with Head's researches ou referred pain and an excellent series of diagrams illustrating the commoner seats of referred pain.

The author accomplishes his aim well, and the book is valuable for detailed study and reference. Yet it has its limitations. We must always remember that in practice we are not treating symptoms or diseases, but that we are dealing with human beings; that while we must analyze every sign and symptom carefully, it is the study of the composite picture which produces the best results. Naturally in a book with so deep an analysis of a single symptom, the general point of view is slightly neglected, even though the author may to a certain extent emphasize the importance of this broader view. S. S.

The Baby—Its Care and Development; for the Use of Mothers. By LE GRAND KERR, M. D., *etc.* Illustrated. Price, $1.00. (*Brooklyn, New York: Albert T. Huntington, 1908.*)

This small volume may serve many a mother well, and, therefore, may be recommended to them. There is no lack of these manuals, some better, some worse. Dr. Kerr's lacks any marked quality of distinction to make it appeal to the medical profession, and as his style is loose and at times ungrammatical, the book can only be endorsed for its sense, and its power of not doing harm. R. N.

The Natural History of Cancer, with Special Reference to its Causation and Prevention. By W. ROGER WILLIAMS, F. R. C. S. (*New York: William Wood & Co., 1908.*)

"Moreover, since the cure of cancer altogether transcends present experience, I have in this work specially endeavored to elucidate the causation and prevention of the disease rather than its cure. . . . . To this end I have devised and applied a new method of cancer research—which may be called synthetic—whereby I have shown that there are modes of life, various habits, and so forth, which tend to prevent the incidence of cancer almost entirely in healthy stocks, and greatly to reduce its ravages, even among those hereditarily predisposed." In this attempt the author has produced a work of nearly 500 large pages, in which he has compiled a great amount of statistics; but without a careful perusal of the book it is quite impossible to reach his conclusions, as he has not summed them up in a final chapter. Conclusions are attached to some of the 23 chapters, but not to all. Thus, the explanation of the causation is not clearly set before the reader, nor is it likely that the causation can be explained by any such statistical study, where conclusions can only be drawn from a balancing of opposing figures. Little of the work presented by the writer is new, and the value of his book rests largely in the collection of data on cancer, otherwise not readily obtainable except in separate volumes. It is not the study of a profound student, and will not be of especial service to those investigating the causation of cancer with true scientific spirit.

The Cure of Rupture by Paraffin Injections. By CHARLES C. MILLER, M. D. (*Chicago: Oak Printing Company, 1908.*)

The title of this small volume exactly describes its contents. If a surgeon wishes to try this method of operation, he will find it well described by the author, who is an enthusiast in advocacy of this procedure.

BOOKS RECEIVED.

Therapeutics; its Principles and Practice. By Horatio C. Wood, M. D., LL. D. Thoroughly revised and rewritten by Horatio C. Wood, Jr., M. D. Fourteenth edition. [1908.] 8vo. 778 pages. J. B. Lippincott Company, Philadelphia and London.

The Cure of Rupture by Paraffin Injections. By Charles C. Miller, M. D. 1908. 16mo. 81 pages. Oak Printing Co., Chicago.

Surgery of the Ureter. An Historical Review (1585-1905). By Benjamin Merrill Ricketts, Ph. B., M. D., LL. D. 1908. 12mo. 244 pages. Cincinnati, Ohio.

The Natural History of Cancer. With Special Reference to its Causation and Prevention. By W. Roger Williams. 1908. 8vo. 519 pages. William Wood and Company, New York.

Scientific Memoirs. New Series No. 33. By Officers of the Medical and Sanitary Departments of the Government of India. *The Production of Alkali in Liquid Media by the Bacillus Pestis.* By Lieut.-Colonel W. B. Bannerman, M. D., B. Sc., I. M. S. 1908. 4to. 12 pages. Superintendent Government Printing, Calcutta, India.

Scientific Memoirs. New Series No. 34. By Officers of the Medical and Sanitary Departments of the Government of India. *Standards of the Constituents of the Urine and Blood and the Bearing of the Metabolism of Bengalis on the Problems of Nutrition.* By Captain D. McCay, M. B., B. Ch., B. A. O., I. M. S. 1908. 4to. 67 pages. Superintendent Government Printing, Calcutta, India.

The Campaign Against Tuberculosis in the United States. Including a Directory of Institutions Dealing with Tuberculosis in the United States and Canada. Compiled under the Direction of the National Association for the Study and Prevention of Tuberculosis. By Philip P. Jacobs. 1908. 8vo. 467 pages. Charities Publication Committee, New York.

Points of Practice in Maladies of the Heart. Lumleian Lectures at the Royal College of Physicians of London. By James Sawyer, Knt., M. D. (Lond.), F. R. C. P., F. R. S. (Ed.), F. S. A 1908. 12mo. 96 pages. Cornish Brothers, Ltd., Birmingham.

An Alabama Student and Other Biographical Essays. By William Osler, M. D., F. R. S. 1908. 8vo. 334 pages. Oxford University Press, American Branch, New York. Henry Frowde, London.

Economic Zoölogy. An Introductory Text-Book in Zoölogy. With Special Reference to its Applications in Agriculture, Commerce and Medicine. By Herbert Osborn, M. Sc. 1908. 12mo. 490 pages. The Macmillan Company, New York.

Transactions of the Society of Tropical Medicine and Hygiene. 1907-1908. 8vo. 303 pages. 1908. The Bedford Press, London.

Report on the Prevention of Malaria in Mauritius. By Ronald Ross, D. P. H., F. R. C. S., D. Sc., LL. D., F. R. S., C. B. 1908. 4to. 202 pages. Waterlow and Sons, London.

High-Frequency Currents. By Frederick Finch Strong, M. D. With 183 illustrations in the text. [1908.] 8vo. 289 pages. Rebman Company, New York.

Introduction à l'Étude Clinique et à la Pratique des Accouchements. Anatomie. Présentations et Positions. Mécanisme. Toucher. Manoeuvres. Extraction du Siège. Version. Forceps. Par Le Professeur L. H. Farabeuf et Docteur Henri Varnier. Préface du Professeur A. Pinard. Dessins démonstratifs de L. H. F., donnant avec les répétitions nécessaires 375 figures dont plusieurs nouvelles. Nouvelle édition revue et augmentée. [1909.] 4to. 488 pages. Georges Steinheil, Paris.

Intestinal Auto-Intoxication. By A. Combe, M. D. Together with an Appendix on the Lactic Ferments with Particular Reference to their Application in Intestinal Therapeutics, by Albert Fournier. Only Authorized English Adaptation, by William Gaynor States, M. D. With eighteen figures in the text, four of which are colored. [1908.] 8vo. 461 pages. Rebman Company, New York.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. By Leading Members of the Medical Profession Throughout the World. Edited by W. T. Longcope, M. D. Eighteenth Series. Volume III. 1908. 8vo. 298 pages. J. B. Lippincott Company. Philadelphia and London.

An Analytical Index of Volumes I to X of the Medical Review. A Digest of the Facts Important to the Practitioner in the Medical Periodicals of the World, 1898-1907. 4to. 201 pages. 1908. The Medical Review, London.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Vol. VIII. Physiology-Rhinolalia. Vol. IX. Rhinoliths-Thermotaxis. 1908. 4to. W. T. Keener & Co., Chicago.

A Manual of Diseases of the Nose and Throat. By Cornelius Godfrey Coakley, A. M., M. D. Fourth edition, revised and enlarged. Illustrated with 126 engravings and 7 colored plates. 1908. 12mo. 604 pages. Lea & Febiger, New York and Philadelphia.

Hygiene for Nurses. By Isabel McIsaac. 1908. 12mo. 208 pages. The Macmillan Company, New York.

Has Surgical Treatment Lessened the Mortality from Appendicitis? By Frank P. Vale, M. D. 1908. 8vo. 165 pages. Fisk Fund Prize Dissertation. No. 51. Providence.

Clinical Diagnosis. A Text-Book of Clinical Microscopy and Clinical Chemistry for Medical Students, Laboratory Workers and Practitioners of Medicine. By Charles Phillips Emerson, A. B., M. D. Second edition. 1908. 8vo. 686 pages. J. B. Lippincott Company, Philadelphia and London.

A Manual of Obstetrical Technique. As Applied to Private Practice, with a Chapter on Abortion, Premature Labor, and Curettage. By Joseph Brown Cooke, M. D. Sixth edition, enlarged and fully revised. Illustrated. 1908. 12mo. 258 pages. J. B. Lippincott Company, Philadelphia and London.

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AN APPENDIX ABSCESS IN A 27-MONTHS' CHILD; WITH AN ANALYSIS OF INFANTILE APPENDICITIS IN THE JOHNS HOPKINS HOSPITAL.

By John W. Churchman, M. D.,

Assistant Resident Surgeon, The Johns Hopkins Hospital.

Appendicitis in children has received a good deal of consideration in the literature; but the word "children" has been used in rather a vague way; deductions have been drawn from statistics including young adults, and separate attention has hardly been called to the extremely interesting class of cases occurring in *very young* children. These cases of infantile appendicitis are strikingly rare, considering the great frequency of the disease a little later in life; and it is not easy to gather from the literature statistics that allow of definite conclusions as to the features of the disease in the first five years of life. The present case—the youngest patient operated on for appendicitis in this hospital—belongs in this class; and is of interest both from a diagnostic and a therapeutic standpoint. In connection with the report of the case an analysis of infantile appendicitis in The Johns Hopkins Hospital has been made. These cases were all treated on the surgical service of Professor Halsted, through whose kindness I have had access to the records.

Case 1.—Surgical Nos. 22,502 and 22,588, male, age 27 mos., June 9, 1908.

First admission: Painful urination; Xray suggestive of vesical calculus; abdomen negative; sounding of bladder showed no stone; recovery.

The patient was brought to the hospital because of painful micturition. The mother stated that urination had been frequent and painful for a year; but five days before admission the trouble became acute and child went a whole day without voiding, crying most of the time. On the fourth day before admission, the urine had to be drawn in the Johns Hopkins Dispensary where a diagnosis of vesical calculus was made. On admission the abdominal examination was negative; temperature 99.2° F., pulse 145. An Xray photograph was taken, which showed a faint shadow suggestive of vesical calculus. The child's bladder was, therefore, searched under ether; but no stone was found. After the searching the urinary symptoms disappeared and the child was discharged in a week perfectly well.

Second admission (to the Mt. Wilson Sanitarium): Gastro-enteric symptoms with fever; abdominal tenderness, becoming localized in right side; no vomiting or urinary symptoms.

One week after leaving the Johns Hopkins Hospital the patient was taken to the Mt. Wilson Sanitarium for the summer. During the week he had "abdominal cramps and fever" and on admission his temperature was 103.4° F. He soon began to give evidence of abdominal pains. The abdomen became tender—more particularly on the right side; and on the fifth day muscle spasm was present, and a probable diagnosis of appendicitis was made. The differential leucocyte count showed: polymorphonuclears 79 per cent; small mononuclears 13 per cent; large mononuclears 7 per cent; eosinophiles 1 per cent. There had been no vomiting and no urinary symptoms.

Third admission (to the Johns Hopkins Hospital): Acute perforative appendicitis with abscess; history and examination typical; no urinary symptoms. Appendectomy and drainage; recovery.

On admission the examination was more satisfactory than is usual in such young patients. The whole abdomen was tense, and there was some tenderness on the left side; but in the right iliac fossa there was definite and exquisite tenderness. No mass could be made out. The percussion note was tympanitic but was somewhat diminished in the lower right quadrant. No rash was present and examination of the throat was negative. Temperature 102.5° F.

Operation: (Dr. Churchman). Under ether a mass could be felt in the right iliac fossa. A right rectus incision was made. There was no free fluid in the peritoneal cavity. After walling off of the general cavity a large abscess was broken into, which lay external to the cecum, ran upward and backward toward the flank, but only a small distance down into the pelvis. The abscess was thoroughly evacuated and the necrotic appendix readily found. Its base was intact and it was ligated with catgut and excised. No attempt was made to invert the stump. The abscess was drained through the rectus incision and also through a counter incision in the flank. For the first few days after operation the child was quite ill. His temperature on the second day reached 104.2° F., and his pulse continued between 140 and 180. Feeding was started 12 hours after operation, one dram of warm milk with lime water being given every two hours. This was soon increased in amount and albumen given on the third day, after the bowels had moved well with enemata. In spite of the continued high temperature and pulse, the abdomen was free from tenderness. There was, however, some distension which was relieved by enemata and stupes. There was no nausea or vomiting. The bowels were quite free (8 stools on the fourth day), but the character of the movements indicated that the food was being well digested. It was thought that the high pulse might in part be due to the iodoform drains; a whiff of chloroform was therefore given, the drains removed and plain gauze re-inserted. The temperature and pulse fell slowly during the next few days, but it could not be demonstrated that this had any connection with the removal of the gauze. On the ninth day the temperature was normal; and on the twenty-seventh day the child left the hospital well. He was seen in the out-patient department one week later with symptoms of a partial obstruction; but the bowels moved well with an enema and on the next visit, two weeks later, he was quite well.

The interesting clinical features of this case were:

a. The youth of the patient (27 mos.).

b. The predominance of urinary symptoms and the original diagnosis of vesical calculus.

c. The high pulse and temperature for several days after operation with negative abdominal condition, suggesting the possibility of iodoform poisoning and the probable wisdom of using plain gauze rather than iodoform gauze in young infants.

d. The rapid and uneventful convalescence after the early postoperative reaction.

There have been 8 other patients under 5 years of age operated on in the surgical clinic of this hospital for appendicitis; and in view of the rather unsatisfactory condition of the statistics in the literature brief outlines of the histories of these cases are here given and an attempt made in this way and by an analysis of the 9 cases to stop the statistical gap.

Case 2.—Surgical No. 3432, female, age 3½ years, September 23, 1894.

Appendicitis simulating tuberculosis of the hip; no abdominal but exclusively joint symptoms. No "attacks." Direct incision and drainage of abscess. Perforation in cecum; spontaneous closure of fecal fistula.

History.—First symptom noticed was a right-sided limp three weeks before admission; no other history; patient brought to hospital for the limp. Examination under ether showed a markedly flexed right leg with great muscular spasm; and considerable lumbar lordosis. Leg was put up in extension, on a diagnosis of tuberculous arthritis. Extension removed after 10 days. Temperature then rose (103.5° F.), but the child complained of nothing. About three weeks after admission, the child then complaining of pain in groin and back, an abscess was opened just above Poupart's ligament and about one ounce of fecal pus removed. Three days later a counter-opening was made along the iliac crest. The child failed to improve and the wound was again explored by Dr. Halsted, and a perforation found in the cecum, which was not repaired. Appendix not found. Convalescence perfect; fecal fistula closed spontaneously.

This case emphasizes again the difficulty of diagnosis and illustrates one of the common errors in differentiation. Even under ether, the flexion and abduction, with muscle-spasm, were so typical as absolutely to mask the real condition. The history, too, was quite unlike that of appendicitis in adults.

Case 3.—Surgical No. 5434½, female, age 4 years, December 18, 1895.

Acute appendicitis without perforation or gangrene. Acute general peritonitis and general streptococcic infection. Death on table.

History.—Habitual constipation. Three weeks before admission, general abdominal pain, with tenderness, distension and constipation. Temperature 101° F. Bowels moved with cascara and symptoms disappeared. Second similar attack one week later. Two days before admission sudden attack of "cramps" in legs and arms, which disappeared in a few hours; next day temperature 104.8° F., but no pain. Temperature rose to 105.8° F., pulse 140; abdominal pain increased, bowels moved with cathartic, vomited once during the night; worst pain complained of is in the epigastrium. Leucocytes 32,000. Transferred from medical to surgical side with every evidence of general peritonitis and in very critical condition.

Operation: Dr. Bloodgood. Appendectomy. Peritoneal cavity contained bloody-serous fluid with fibrin flakes, from which streptococcus was grown. Appendix injected but not perforated. Death on table. Cultures at autopsy showed a general streptococcus infection.

This was an interesting case of streptococcic septicæmia, and general peritonitis, with no other discoverable cause than an unperforated appendicitis and entero-colitis. The development of the condition while the patient was under careful observation emphasizes the difficulty of diagnosis in children.

Case 4.—Surgical No. 15,382, male, age 3 years, October 31, 1903.

Acute perforative appendicitis with spreading peritonitis; typical attack with classical manifestations, including urinary symptoms; appendectomy and drainage; uneventful recovery.

History.—Onset 68 hours before admission with cramp-like general abdominal pain, later localized in right iliac fossa; vomiting, constipation, explosive and frequent urination; temperature 101° F.; leucocytes 40,000.

At operation (Dr. Finney) a rectus incision was made, and turbid fluid encountered in the peritoneal cavity.

Appendix was perforated nearer the tip than the base; considerable turbid fluid in the pelvis. Usual appendectomy (ligation with catgut and careful closure of serosa over stump) with drainage. Rapid and uneventful recovery.

In spite of the typical history of this case the note is made in the record that "on account of the patient's age diagnosis was difficult."

CASE 5.—Surgical No. 16,636, male, age 4 years, September 5, 1904.

Acute perforative appendicitis with general peritonitis; typical attack with vague urinary symptoms; appendectomy and drainage; intestinal obstruction; enterostomy; death on eleventh day; at autopsy an abscess on left side.

First symptoms 60 hours before admission; general abdominal pain, becoming localized in right iliac fossa; vomiting; constipation; difficult urination on day before admission. Temperature 103.2° F.; leucocytes 7300; general symmetrical distension, limitation of respiratory movements and positive signs of general peritonitis.

Operation (Dr. Sowers). Right rectus incision; foul smelling turbid fluid throughout peritoneum; appendectomy and drainage. Later, intestinal obstruction; enterostomy. Child lived for 10 days with a continual fever, distension, occasional vomiting; right-sided pneumonia and pleurisy on ninth day. At autopsy an abscess found in the left side.

There were no features in this case differentiating it from a similar condition in an adult.

CASE 6.—Surgical No. 17,232, male, age 5 years, January 9, 1905.

Acute gangrenous appendicitis with early abscess; typical attack without urinary symptoms; appendectomy and drainage; post-operative obstruction (nineteenth day); enterostomy; recovery.

History.—First symptoms four days before admission; attack quite typical as regards abdominal pain, vomiting, distension and constipation; no urinary symptoms. Examination showed tenderness and rigidity without muscle spasm in the lower right iliac fossa; no mass felt. Temperature 102.3° F. Leucocytes 11,000.

At operation (Dr. Follis) a right rectus incision was made and the peritoneum opened just at the edge of an early abscess, which was ruptured in the attempt to wall off the intestines; a large amount of foul pus escaped; the abscess was large, extending up to the liver and down into the pelvis on the right side and also into the left side of the pelvis, the appendix was gangrenous at its tip, as was the cecum at its base. Appendectomy and drainage; loop of bowel left in wound. Fairly quiet convalescence, though catheterization was necessary on the fifth day; gradually developing intestinal obstruction on nineteenth day, requiring enterostomy, after which round worms were passed by mouth, through fistula and in stools.

The clinical features of this case were typical and the diagnosis presented no difficulty. The bladder symptoms on the fifth day, and the late occurrence of intestinal obstruction associated with ascaris lumbricoides were the interesting features. Two uncles had been operated on for appendicitis.

CASE 7.—Surgical No. 17,836, male, age 5 years, June 3, 1905.

Acute perforative appendicitis with abscess; attack characterized by marked central nervous system symptoms (cerebro-spinal meningitis?); appendectomy and drainage; recovery.

History.—Patient admitted to hospital with clinical diagnosis of cerebro-spinal meningitis; the disease started two weeks before admission with vomiting; 12 hours after onset a convulsion, with unconsciousness and jerking of arms and legs; head was retracted and child often raised hand to head as if in pain; child was not able to speak after the convulsion, but apparently understood what was said to him; at times motioned to his abdomen as if in pain; no urinary symptoms; temperature 100.5° F., leucocytes 11,200. Patient in semi-comatose condition on admission, but apparently understood what was said. Condition suggested meningitis, but Kernig's sign was absent, lumbar puncture showed no increased tension and fluid obtained was sterile. There was a mass in the right iliac fossa, over which there was tenderness and muscular rigidity.

At operation (Dr. Watts) a large bi-locular appendix abscess was found extending into the pelvis, where the appendix lay. It was ligated and amputated, but the carbolized stump was not inverted. Iodoform gauze drainage. For the first few days after operation, there was great restlessness, and muscular twitching; right arm moved about uncontrollably. The head was retracted and the neck held stiff. Patient was unable to speak. These symptoms, however, gradually disappeared, speech returned and on the 45th day patient was discharged well.

This case was a most unusual one. Abdominal examination made the existence of an appendix abscess certain; but the onset of the disease was atypical, and the cerebral picture difficult to explain. A cerebral palsy of infectious origin was thought of (Dr. Cushing). That the two conditions were not independent seems certain from the simultaneous onset of the abdominal pain with vomiting, and the curious cerebral symptoms; as well as from the disappearance of the latter after the operation.

CASE 8.—Surgical No. 18,562, male, age 4 years, December 14, 1905.

Acute appendicitis with abscess; clinical features typical; incision and drainage of abscess; appendix not removed. Second attack with abscess 22 months later; incision and drainage of abscess; appendix not found. Third attack four months later with large abscess in the left iliac fossa; incised and drained through the mid-line; partial intestinal obstruction; laparatomy, freeing of adhesions, appendectomy, drainage; recovery.

History, First Admission.—Onset one week before admission with typical features, but no urinary symptoms. Patient admitted with general abdominal distension; a large spherical mass just to the right of and a little below the umbilicus; temperature 99.8° F.; leucocytes 15,700.

Operation (Dr. Sowers). Right rectus incision just median to the abscess which was opened after packing off the general cavity. A large amount of pus evacuated; appendix not sought for; iodoform gauze drainage; Uninterrupted recovery. Twenty-two months later, an abscess again developed which was opened and drained (at Elkins, W. Va.); appendix not found.

Second Admission.—Marked feature since the first admission was obstinate constipation. The present attack began four days before admission, and the features were typical; no urinary symptoms were present. The child was quite ill on admission; temperature 99.8° F.; leucocytes 24,000. The whole lower *left* quadrant was occupied by a tender, resistant mass which could be felt per rectum.

Operation (Dr. Churchman). A mid-line incision was made, the abscess opened directly, evacuated and drained (counter incision in flank). Patient did very well until the 15th day when definite signs of a partial obstruction appeared, with visible peristalsis.

Laparotomy (Dr. Churchman). Right rectus incision; adhesions of bowels separated, and partial obstruction freed; appendix removed (tip lay in pelvis); loop of bowel left in wound for enterostomy. Patient vomited round worms the night after operation. Obstruction disappeared, no enterostomy was needed and recovery was uneventful.

The abscess of appendicial origin appearing on the left side (evidently remains of an old horse-shoe abscess) was of interest

in this case. The repeated attacks and the excellent way in which the child stood the four successive operations are to be noted. Absence of bladder symptoms in spite of the large pelvic abscess on both sides was striking. The late occurrence of intestinal obstruction associated with ascaris lumbricoides should be kept in mind in connection with Case 6.

Case 9.—Surgical No. 20,299, male, age 5 years, February 12, 1907.

Acute recurrent unperforated appendicitis; history typical; free fluid in peritoneum, but appendix nearly normal in appearance; appendectomy and closure; recovery.

History.—Onset 30 hours before admission; clinical features characteristic, but no urinary symptoms. Patient had had a similar attack six months before admission, which lasted only one evening, but was accompanied by vomiting. There was slight resistance over the right half of the abdomen, but no muscle spasm or rigidity. The abdominal condition was, indeed, nearly negative; temperature 101.4° F.; leucocytes 8000.

Operation (Dr. Finney). McBurney incision. A considerable amount of clear, free fluid was found in the peritoneum. Appendix so normal in appearance as to make the diagnosis doubtful; but exploration of the other viscera was negative. Appendectomy and closure. Rapid and uneventful convalescence.

The interesting features of this case were the recurrent attacks and the presence of free fluid with an appendix nearly normal macroscopically. The case was a striking illustration of the tendency of the infantile peritoneum to react with an effusion of fluid to slight inflammations. It was really a spreading peritonitis seen in its incipiency and shows how such a condition may develop without gross lesion of the appendix (cf. Case 3, in which a general purulent peritonitis of appendicial origin existed without macroscopic perforation of the appendix.) Microscopic examination of the appendix showed a definite early inflammation of the mucosa.

Two other appendectomies in infants under 5 years done in this hospital may be here recorded. About 100 cases of inguinal hernia containing the appendix (a condition first noticed by Morgagni) are reported in the literature; and of these about 23 per cent were observed during childhood. The two cases here reported throw no light on the clinical side of infantile appendicitis, for in both the appendix was practically normal; they should, however, be included in the series as they influence the conclusions to be drawn as to the seriousness of appendectomy in young infants.

Case 10.—Surgical No. 17,142, male, age 19 months, December 17, 1904.

Right acquired indirect inguinal hernia, strangulated; the sac contained free fluid, loops of strangulated, but not gangrenous, ileum and the cecum with appendix; the hernia was readily reduced, the appendix removed in the usual manner, its stump inverted, and a radical cure of the hernia done. Convalescence was uneventful.

Case 11.—Surgical No. 20,423, male, age 3 years, April 3, 1907.

Right acquired indirect inguinal hernia; sac contained cecum and appendix; appendectomy and inversion of stump; radical cure of hernia; convalescence uneventful.

The Frequency of Infantile Appendicitis.

It has long been well known that appendicitis was a disease of young adults and that it was relatively infrequent in children; but if one consults the statistics in the literature one finds difficulty, on account of the vagueness of the terms used, in determining just *how* infrequent the disease is in the early years of life. Furthermore, there has been little effort made to separate the appendicitis of *children* (which as a matter of fact is not rare at all but only slightly less frequent than the appendicitis of young adults) from the appendicitis of *infants*, a condition infrequent enough to be always of interest. The figures, for instance, of Miss Gordon's Paris thesis (L'Appendicite chez L'Enfant) are widely quoted in the literature; yet of the 78 cases for which histories are given, only 5 were in the first 5 years of life, a majority were in the second decade when, as a matter of fact, appendicitis is nearly at its maximum frequency, and one history is included of a lad of 19. Deductions from such statistics have no true bearing, of course, on infantile appendicitis. The word "children" is used in a sufficiently vague way elsewhere in the literature and for this reason the statistics are most unsatisfactory. Sonnenburg, for instance, says that 20 per cent of the cases occur "in children"; Karewski, that 42 per cent occur before puberty; and Sahli that the disease is as frequent "in children" as tonsillitis. In Landouzy's clinic at the Hôpital des Enfants-Malades in Paris, from 1871-1883 only 26 cases of appendicitis were recorded under 14 years of age among nearly 50,000 "children"; and in Henoch's Clinic at the Charité in Berlin, only 2 cases were seen between 1890 and 1894, out of nearly 3000 "children" treated. From the Kaiser & Kaiserin Friedrich Krankenhaus in Berlin, the following statistics were given out:

1890.....	494	patients	treated;	no	appendicitis;		
1891.....	415	"	" ;	"	"		
1892.....1692		"	" ;	3	cases of	appendicitis;	
1893.....2232		"	" ;	4	"	"	"
1894.....2580		"	" ;	8	"	"	"
Total...7413		"	"	15	"	"	"

or a percentage of only .202+. In general, as Karewski points out, the disease has been very rarely recognized in hospitals where there is no operating done and more frequently seen in surgical clinics.

In the records of the Johns Hopkins Hospital there are complete histories of 1223 cases of appendicitis. These I have analyzed, as regards the age of the patients, by considering the cases in 5-year groups or pentads. Cases falling in the first pentad (i. e., in the first 5 years of life) are called infantile appendicitis; cases falling in the second and third pentads (i. e., between the 6th and the 15th year inclusive) are called appendicitis in childhood; cases falling in the 4th, 5th and 6th pentads (i. e., between the 16th and 17th year inclusive, or the period of maximum frequency), appendicitis in young adults. This paper is concerned chiefly with infantile appendicitis, i. e., appendicitis occurring in the first 5 years of life. The results of this analysis are as follows:

	Pentad.	Years (inclusive.)	No. of cases.	Percentage.
Infantile Appendicitis ...	1	1- 5	9	.735
Appendicitis in Childhood	2	6-10	50	4.+
	3	11-15	140	11.44
Appendicitis in Young Adults..	4	16-20	199	16.27
	5	21-25	255	20.85
	6	26-30	196	16.02
	7	31-35	112	9.15
	8	36-40	98	8.01
	9	41-45	68	5.56
	10	46-50	34	2.78
	11	51-55	26	2.12
	12	56-60	18	1.47
	13	61-65	10	.817
	14	66-70	2	.163
	15	71-75	5	.409
	16	76-80	1	.082
		81-100	0	.000
			1223	

From these figures may be constructed the following curve of frequency (Chart I):

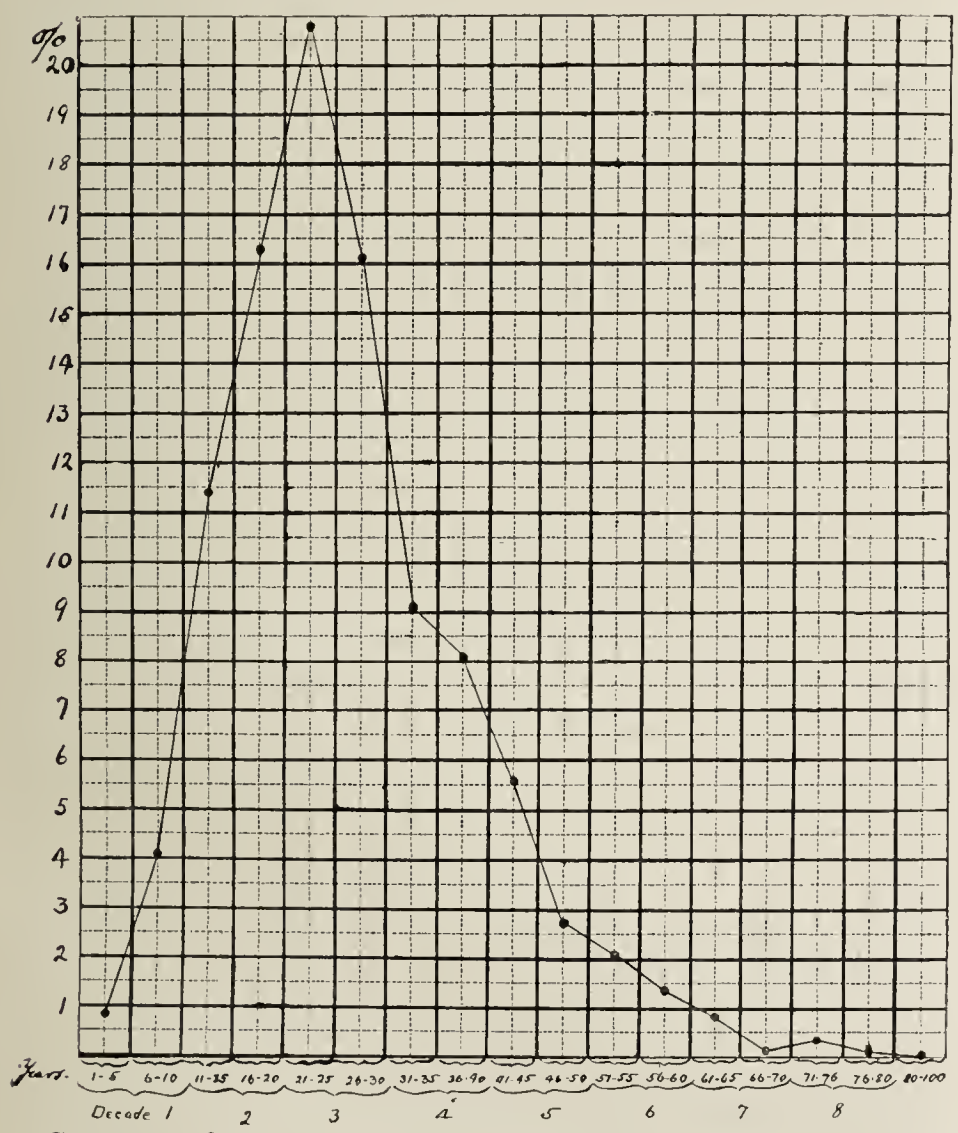


CHART I.—Curve showing the incidence of appendicitis at the various ages, constructed from an analysis of 1223 cases treated in the surgical clinic of the Johns Hopkins Hospital. The figures on the left indicate percentages; those below, the years of life.

From this chart it will be seen:

a. That appendicitis is most frequent between the 21st and the 25th years (20.85 per cent of the cases).

b. That appendicitis in childhood is not a rare but a very frequent disease, nearly 16 per cent of the cases occurring between the 6th and the 15th years.

c. That the curve of frequency assumes a nearly symmetrical form; rising rapidly to its summit in the 5th pentad, falling just as rapidly to the 10th pentad and then more gradually dropping to practically zero after the 65th year.

d. That infantile appendicitis is a rare disease.

A somewhat similar table has been published by McCosh, representing an analysis of 1001 of his own cases:

Pentad.	Years.	No. of cases.	Percentage.
1	1- 5	17	1.7
2	5-10	51	5.1
3	10-15	85	8.5
4	15-20	113	11.3
5	20-25	176	17.6
6	25-30	176	17.6
7	30-35	149	14.9
8	35-40	99	9.9
9	40-45	65	6.5
10	45-50	35	3.5
11	50-55	15	1.5
12	55-60	11	1.1
13	60-65	6	.6
14	65-70	2	.2
15	70-75	1	.1
	75-100	0	.0

From these figures I have constructed a second similar frequency curve (Chart II).

This curve will be seen to be strikingly like the one (Chart I) representing the statistics of this hospital; so that the two charts (representing a total of 2224 cases) may be taken to present the facts as to the age incidence of appendicitis. They *really* represent, rather, not the frequency with which appendicitis *occurs* at the various ages, but the frequency with which it is recognized in a large general hospital. The difficulty of diagnosis is, of course, nowhere so great as in the infantile cases; and it seems very probable that the figures here given (.735 per cent in The Johns Hopkins series, 1.7 per cent in the McCosh series) are far below what they would be if the diagnosis in the first 5 years of life were as simple as it is in adults. It is interesting in this connection to compare a table (taken from Manley's article) which shows the proportion of *deaths from infantile appendicitis* to the *total number of deaths from appendicitis* in a large city (New York).

Year.	Total deaths from Appendicitis.	Deaths from Infantile Appendicitis.[1]
1890.....	87	4
1891.....	83	4
1892.....	129	4
1893.....	87	2
1894.....	117	4
1895.....	182	17
1896.....	201	8
1897.....	193	6
1898.....	252	8
1899.....	306	18
	1637	75 = 4.58%

[1] In this table the figures given include only children *under* five, and, not as in the previous tables, children between one and five inclusive. Inclusion of the five-year-old children, which would make the table exactly comparable to the previous ones, would, of course, increase the percentages here given.

Clinical Features of Infantile Appendicitis.

It is quite unnecessary to enumerate the well-recognized marks of appendicitis which characterize the disease as it occurs in childhood. All that has been said as to the diffieulty of the diagnosis in children may be said a good deal more forcibly of appendicitis in infants; and it is in this place only necessary to state the elinical features which the study of the Johns Hopkins cases brings out.

a. *Sex.*—Six of the patients were males, three females. It is interesting to find the predominance of the disease among males obtaining in infancy. The usual explanations offered for this fact in adults (greater liability of the male sex to exposure and to trauma, greater tendeney to errors in diet and



Chart II.—Curve showing the incidence of appendicitis at the various ages, constructed from an analysis of 1001 cases published by McCosh. As in Chart I, the figures on the left represent percentages; those below, the years of life.

frequency of digestive disturbances due to the excessive use of tobaeco) can hardly be suggested as aceounting for the predominanee among infants.

b. *Heredity.*—There is no note in the histories of our patients as to the oeeurrenee of other cases in the family, except that two uncles of Case 6 had been operated on for the disease.

c. *Previous Attacks.*—Five cases gave no history of previous attacks; in all of these the appendix was perforated. One of the five eases had general peritonitis, one had a spreading peritonitis, two had abscesses and one a gangrenous appendix with beginning abscess. So that the disease was of a severe type when first reeognized. One patient (Case 9) had had a typieal attaek 6 months before admission; another (Case 3) had had two such attaeks, and another (Case 8), was admitted 2 years after the first stay in the hospital for his third attack, and a fourth (Case 1) was treated in this hospital for vesieal ealculus during what was probably his first attaek of appendicitis.

d. *Diagnosis.*—In three of the eases the signs and symptoms were typieal and the diagnosis offered no difficulty. This was also true of Case 1 on the seeond admission. Four of the cases presented interesting diagnostic difficulties.

Case 2.—This ease was taken to be *tuberculous arthritis* and treated as such for nearly 3 weeks. There had been no symptoms before admission except a right-sided limp. Even under ether, the signs were those of a joint-involvement; and the diagnosis was only made when an abscess, containing fecal pus, formed above Poupart's ligament.[2]

Case 3.—In this patient a *general fibrino-purulent peritonitis* developed in less than 48 hours after the first symptom and while the patient was under observation. There is no note of any urinary symptoms; flexion of the thigh first appeared about 40 hours after the onset and about 6 hours before the operation, whieh revealed a general peritonitis. The diagnosis was simple when the disease had become severe; in the early stage it was diffieult. But the progress of the condition was so rapid that the patient reached the surgeon too late.

Case 7.—The history was suggestive of *cerebro-spinal meningitis,* as were many of the signs on admission. There was, however, a definite mass in the right iliac fossa and the diagnosis of appendicitis was positive. The peculiar nervous manifestations seem to have been infectious in origin and it is probable that the whole symptom eomplex was a manifestation of the appendicitis.

Case 1.—The first diagnosis was *vesical calculus.* Not only were urinary symptoms the *only* symptoms, but abdominal examination was negative, the Röntgen picture suggestive and the temperature normal. The probable sequence in this case was as follows: An aeute appendicitis, with obseure onset but characterized pathologically by a slight pelvic peritonitis eausing bladder symptoms; subsidence of the attack; seeond attack with rupture—probably near the cecum; formation of abscess, which did *not* extend into the pelvis (hence absence of bladder symptoms on third admission).

Inasmuch, then, as an appendicitis of the severest type may be present in children without one of the elassical symptoms and even a general peritonitis may develop under careful observation, it is perhaps not unwise to call attention again to the occurrence of infantile appendicitis, that those who see many infants may be constantly on their guard. At present, on account of the difficulty of diagnosis and the fulminant character of the disease, only the severest eases come to surgery; yet even for these (as will be seen below) surgery ean do a good deal. It could do much more if the diagnosis were

[2] No measurements were made, and no Röntgen photograph was taken.

made early.[3] *All urinary symptoms in children should suggest the possibility of appendicitis, and in infants with apparent hip-joint disease, particularly if the thigh be flexed, the same possibility should be kept in mind. "Cathartics should never be given for constipation unless it is certain that appendicitis is absent; all cases with abdominal pain should be regarded as appendicitis until proven otherwise and cathartics avoided"* (Karewski). *Palpable resistance on the right side by rectal examination is one of the most frequent findings; Selter goes so far as to call it absolutely constant. The importance, therefore, of rectal examination in any doubtful case is obvious.*

The Pathology of Infantile Appendicitis.

It is well-known (the fact will be referred to again when speaking of the mortality of the disease) that appendicitis in children presents certain pathological features which distinguish it from the same disease in adults. These are: a. The tendency to early perforation; and b. The frequency of spreading peritonitis. Whether this state of affairs has a purely anatomical basis in the thinness of the infantile appendicial mucosa, or is merely due to the fact that most of the less severe cases go unrecognized and only those with perforation and spreading peritonitis are frequently seen, there is quite general statistical agreement that the disease is much oftener diffuse in infants than in adults. In the 9 Johns Hopkins cases the following pathological conditions were found:

General peritonitis, without perforation of appendix,	1 case	2 cases
" " with " " "	1 case	22.22%
Circumscribed abscess	4 cases	44.44%
Spreading peritonitis	1 case	11.11%
Early abscess (i. e. adhesions had begun to wall the inflammation off; but these were so delicate that it was impossible to operate without breaking them up and practically producing a spreading peritonitis)	1 case	11.11%
Unperforated appendix with free serous fluid about it	1 case	11.11%

In only 2 of the 9 cases (22.22 per cent) was the appendix unruptured; and in one of these (Case 3) a streptococcus fibrino-purulent peritonitis and general streptococcus septicæmia were present.

Intestinal obstruction occurred in 4 cases (44.44 per cent). In two of these (22.22 per cent) it was complete and required an enterostomy; in a third case, laparotomy and freeing of adhesions was sufficient; and in the fourth the partial obstruction was promptly relieved by enemata. In two of the 4 obstruction cases the obstruction was associated with the presence of ascaris lumbricoides; in one case (Case 8) the worms were vomited after a laparotomy and freeing of adhesions had been done; in the other case (Case 6) the worms were vomited, passed by rectum and through the enterostomy wound.

[3] It is quite unnecessary here to call attention to the numerous well-known conditions which may simulate appendicitis in infants or the numerous symptoms, characteristic of other diseases, which appendicitis may cause. Certain of the diagnostic features, brought out by the Johns Hopkins cases, may, however, be emphasized.

The Mortality of Infantile Appendicitis.

Here again statistics vary greatly, as the following list will show:

Rotter	lost	66⅔%	of 6	cases.
Israel	"	47 %	of 15	"
Broca	"	44 %	of 59	"
Karewski	"	41 %	of 17	"
Lenander	"	25 %	of 4	"
Sonnenburg	"	15 %	of 26	"

The variations in the statistics are largely due, as Karewski has pointed out, to the fact that certain operators have had in their series a preponderance of severe cases. If the statistics of Sonnenburg, for instance, be analyzed with this point in mind, the following results are obtained:

	Circumscribed perityphlitis.	Diffuse perityphlitis.
Sonnenburg..	Mortality of 0.0%	Mortality of 50%

In general the statistics show that surgeons who operate late report the highest mortality.

The following are the facts as regards the mortality in the Johns Hopkins series:

Total number of cases	9
Recoveries	7
Deaths	2
Mortality	22.22%

An analysis of the mortality, with reference to the pathological condition, follows:

Cases with general peritonitis....2;	deaths, 2;	mortality,	100%
" " circumscribed abscess....4;	" 0;	"	0%
" " spreading peritonitis....1;	" 0;	"	0%
" " early abscess (see under pathology) 1;	" 0;	"	0%
" " unperforated appendix ...1;	" 0;	"	0%

The series is, of course, too small to warrant sweeping conclusions. Yet it must be said that in all probability an enlargement of the series would diminish and not increase the mortality; for the series already includes 2 patients (22.22 per cent) with general peritonitis (the only fatal cases)—certainly a fair proportion of cases for which surgery, even in adults, can offer only a moderately good prognosis. On the other hand, the surgeon must expect a larger proportion of such cases among infants than among adults; so that the difficulty of diagnosis will probably always keep up a mortality which, so far as the operation is concerned, is encouragingly low. Taking the statistics as they stand the results are most encouraging. Case 3, a patient with general streptococcus peritonitis and septicæmia, was entirely beyond surgical help quite aside from her age. An adult with a condition similar to that of Case 5 *might* have recovered, though the prognosis would have been decidedly bad. In all the other cases the result of the operation was just as satisfactory as it would have been in adults. Several of the patients made rapid and uneventful recoveries, standing the operation just as well as adults. The striking way in which young infants stand laparotomy for appendicitis has frequently been noted

and it was a feature of our series. Case 8, for instance, a boy of 4 years on his first admission, underwent four abdominal operations (3 times, incision and drainage of an appendix abscess; once, appendectomy and freeing of partial obstruction); yet he stood them all well, made a good recovery and left the hospital well.

It is most encouraging to compare the results in this series with Matterstock's statement in Gerhard's Handbuch (Edition 1880) that the prognosis, in children in the first 5 years of life, is almost absolutely bad. Of 12 children under 6 years reported by Matterstock, 11 died (mortality 91.66 per cent); one 5 year-old child recovered. Between 6 and 10 the prognosis is said to be better; yet at this age there were only 9 recoveries out of 24 cases—a mortality of 62.5 per cent.

Appendectomy in itself is certainly not a serious operation in young infants. Adding to the 7 cases of appendicitis in whom appendectomy was done, 2 patients in the first 5 years of life from whom the appendix was removed during the radical cure of a hernia we find that of the 9 cases, 8 recovered (mortality 11.11 per cent) and the only fatality was in a patient with general peritonitis. Or, including all 11 cases in which either the appendix was removed or a laparotomy done for appendicitis we find that 9 cases recovered (mortality 18.18 per cent), the only fatalities being in 2 cases with general peritonitis.

CHART III.

Case.	Sex.	Age.	Previous attacks.	Family history of appendicitis.	Diagnostic features.	Appendix perforated.	Abscess.	Spreading peritonitis.	General peritonitis.	Appendix removed.	Treatment of stump.	Fecal fistula.	Intestinal obstruction.	Result.	
1	M.	27 mos.	1(?)	0	Diagnosed vesical calculus.	Yes.	Yes.	No.	No.	Yes.	Simple ligation.	No.	Partial about 4th wk.	Recovery.	Diagnosis of vesical calculus on first admission; diagnosis clear on second admission.
2	F.	3½ yrs.	0	0	Diagnosed tuberc. arthritis.	P. in cecum.	Yes.	No.	No.	No.	....	Yes.	No.	Recovery.	Fecal fistula closed spontaneously.
3	F.	4 yrs.	2	0	Peritonitis developed under observation.	No.	No.	No.	Yes.	No.	....	.....	.....	Death on table.	Condition developed rapidly under observation.
4	M.	3 yrs.	0	0	.....	Yes.	No.	Yes.	No.	Yes.	Ligation and inversion of stump.	No.	0	Recovery.	
5	M.	4 yrs.	0	0	.....	Yes.	No.	No.	Yes.	Yes.	Simple ligation.	No.	11th day.	Death on 11th day.	Pneumonia and pleurisy developed after operation; left-sided abscess found at autopsy.
6	M.	5 yrs.	0	Two uncles.	.....	Yes.	Early.	?	No.	Yes.	Simple ligation.	No.	19th day.	Recovery.	Enterostomy done; ascaris lumbricoides vomited and passed from bowel.
7	M.	5 yrs.	0	0	Signs positive; symptoms confusing.	Yes.	Yes.	No.	No.	Yes.	Simple ligation.	No.	No.	Recovery.	Remarkable associated nervous symptoms.
8	M.	4 yrs.	2	0	.....	Yes.	Yes.	No.	No.	On third admission.	Ligation and inversion of stump.	No.	15th day.	Recovery.	Obstruction associated with vomiting of round worms.
9	M.	5 yrs.	1	0	History typical; abdomen suggestive.	No.	No.	Yes.	No.	Yes.	Ligation and inversion of stump.	No.	No.	Recovery.	A macroscopically normal appendix with free fluid in the pelvis.

Removal of the Appendix.

The discussion which has waged as to the proper time to remove the appendix in abscess cases may be said to have been pretty generally settled in favor of immediate removal except in cases where the illness of the patient demands the shortest possible operation or where the appendix cannot be found without unduly prolonged search. And such cases are rare. In the case of children, however, certain authors still advise incision of the abscess only; and subsequent appendectomy, *à froid*, when the operation is without mortality. Such a course is recommended by Karewski and has been followed by Broca.

Of the 9 cases in our series, the appendix was removed at the first sitting in 6 (66.66 per cent). In one case (Case 8) it was removed at the fourth operation. In two cases the appendix was not removed; one of these patients (Case 3) died on the table of general septicæmia and peritonitis. The other case developed a fecal fistula after incision of an appendix abscess, but the fistula closed spontaneously. In the seven appendectomies, the appendix was simply ligated with catgut four times; in the three other cases, the ligated stump was carefully inverted into the cecum with a purse-string suture of fine silk, reinforced by mattress stitches of fine silk. None of the cases developed a fecal fistula.

The surgical problem of infantile appendicitis is then the problem of diagnosis. There is no more reason, indeed there is very much less reason, for operative delay in these cases than in adults. If the patients could be operated on before perforation has taken place a very large majority, if not practically all of them, could be saved. But even after perforation has occurred the prognosis with operation is distinctly good; the danger of obstruction is then the chief disturbing feature. It is absolutely essential to get the cases before peritonitis has become general, *for in these cases the prognosis is almost absolutely bad.* In view of the rapidity with which a general peritonitis may develop and of the increasing seriousness of the

prognosis as a simple appendicitis becomes a spreading peritonitis, an appendix abscess or a general peritonitis, the rule for adult appendicitis holds also for infantile appendicitis: make the diagnosis early and operate as soon as the diagnosis is made.

POST-OPERATIVE COMPLICATIONS.

A right-sided pneumonia and pleurisy developed in Case 5 on the 9th day. Intestinal obstruction, as has been noted, occurred four times; on the 11th, the 15th and the 19th day and in one case, after the patient had left the hospital. The remote possibility that the continuation of symptoms in Case 1 after operation may have been due to iodoform absorption has already been mentioned.

For purposes of reference the chief features of this series have been tabulated (Chart III).

Reference is made in the text to the following articles:

Matterstock: Chapter on Appendicitis in Children in Gerhardt's Handbuch der Kinderkrankheiten. (Edition 1880.)
Karewski: Deutsche med. Wchnschr, 1897. Bd. 23, p. 294.
Selter: Arch. f. Kinderh., 1901, Bd. 31, p. 89.
McCosh: J. Am. M. Ass., Sep. 24, 1904.
Gordon: L'Appendicite chez l'Enfant. Thèse de Paris, 1896.
Manley: J. Am. M. Ass., June, 1901.

THE RELATION OF BOVINE TO HUMAN TUBERCULOSIS.

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Although tuberculosis was known many years before the beginning of the Christian Era, modern work on the subject may be said to have begun in 1865, when Villemin presented his important communication "On the Cause and Nature of Tuberculosis and the Inoculation of the Same from Man to Rabbits." His work was carried out in a methodical and thorough manner. "He inoculated not only with tubercular material from human beings, but also from cases of bovine tuberculosis, and proved experimentally the identity of the latter disease with human tuberculosis."

The above words from Koch (1) are interesting in view of the opinion which he expressed at the British Congress on Tuberculosis in 1901, and in the main so tenaciously clings to to-day.[1]

Notwithstanding Villemin's careful work the partisans of the non-specific theory were not convinced. To the decision of this question Cohnheim and Salomonsen contributed largely by selecting for inoculation the anterior chamber of a rabbit's eye, and they established the fact that tuberculous materials apparently differing widely from each other are characterized by one and the same specific contagium.

[1] The following quotations are from that memorable address. "Considering all these facts," referring to his recent experiments, he says, "I feel justified in maintaining that human tuberculosis differs from bovine, and cannot be transmitted to cattle." Speaking of the reciprocal relation, he says, "If the bacilli of bovine tuberculosis were able to infect human beings, many cases of tuberculosis caused by the consumption of alimenta containing tubercle bacilli could not but occur among the inhabitants of great cities, especially the children, and most medical men believe that this is actually the case. In reality, however, it is not so." After quoting autopsy statistics regarding the incidence of primary intestinal tuberculosis in children reported by several German observers, Koch concludes this subject by saying, "I should estimate the extent of infection by the milk and flesh of tubercular cattle, and the butter made of their milk, as hardly greater than that of hereditary transmission, and I, therefore, do not deem it advisable to take any measures against it." (Trans. British Congress on Tuberculosis, Vol. I, 1901.)

Without pausing let us pass to the discovery of the tubercle bacillus by Koch. The field of bacteriology had already proved a fertile one and important discoveries had been made in it since the promulgation of the Germ Theory of Disease by Henle in 1840.

Davaine had discovered the anthrax bacillus in the blood of animals dead of charbon and Pasteur had done his notable work on this disease. Koch says, "In my investigations into the etiology of tuberculosis, I have followed the method by which the parasitic nature of splenic fever was so effectually established."

The history of the discovery of the tubercle bacillus is a familiar story, and much knowledge concerning its morphology, peculiar cultural characteristics, staining reaction, etc., has been obtained but perhaps few realize how much of this knowledge was brought to light by Koch himself a quarter of a century ago. His researches form a truly monumental piece of work and are a model of thoroughness and scientific accuracy.

In reviewing his famous communication (The Etiology of Tuberculosis) with the question of the relation of human and bovine tuberculosis in mind, one is struck by certain conclusions he then reached, especially in the light of his more recent statements on this subject. He states that Villemin did thorough and methodical inoculation experiments, using material from man and cattle, "and proved experimentally the identity of the latter disease with human tuberculosis." As a result of his own experiments he says, "The perfect identity and unity of the tuberculous process in different kinds of animals cannot be doubted."

Cultures from a large number of cases of tuberculosis, human and other, were made with the view of determining if cultural differences might become apparent between bacilli from different sources. Koch writes: "It seemed to me, however, not improbable that though bacilli from various forms of tuberculosis, *perlsucht,* lupus, phthisis, etc., presented no differences microscopically, yet that in cultures, differences might become apparent between bacilli from different sources.

But, although I devoted the greatest attention to this point, I could find nothing of the kind."

After describing numerous inoculation experiments, he says: "I was not able to demonstrate any differences in the effect of inoculation with material derived from varieties of the tuberculous process, as miliary tuberculosis, phthisis, scrofula, fungous inflammation of joints, lupus, *perlsucht* and other forms of animal tuberculosis."

At the time of his original communication Koch states as his opinion that of the forms of tuberculosis, phthisis and tuberculosis of domestic animals are the important ones as regards spreading infection. Further on he states that, "It is certain that the milk of tuberculous animals may give rise to infection."

The bacillus was first discovered in a preparation stained by strongly alkaline methyline blue. He used acid decolorization, but called attention to other means of decolorizing. He took advantage of counter staining when studying the bacilli in tissues. He showed the value of heat in causing the stain to penetrate, but recommended staining in the cold 12 hours or longer for the best results. He found that the bacillus of leprosy also resisted acid decolorization and predicted that others giving the same staining reaction would be discovered. He announced as a probability that tubercle bacilli are surrounded by a membrane which has a different relation to staining reagents than have the contents, gave his reasons for thinking so, and suggested that the acid-fast quality may depend on this membrane.

The microscopic appearances of tubercle bacilli are described with great accuracy as is also the histological structure of the tubercle.

Koch was thoroughly convinced of the existence of spores in tubercle bacilli and thus explained the infectious nature of the cheesy centers of tubercles in which it is notoriously difficult to demonstrate bacilli.

Regarding the spread of the virus through the body, he refers to the two methods previously demonstrated—one by Ponfick, who discovered the thoracic duct as a channel of infection, and the other by Weigert, who showed that the virus might be disseminated through the veins,—and describes a third mode; namely, by the rupture of a tuberculous focus into an artery.

Mixed or secondary pulmonary infections were noted and the proper significance placed on the presence of the secondary invaders. He made the interesting and significant observation that tubercle bacilli can pass from the blood into the kidney tubules and thence into the urine—an analogue to facts which have since been demonstrated; namely, that tubercle bacilli may be excreted in the milk of a tuberculous cow without lesion of the udder, and that they may pass through the intact epithelium of the intestines without leaving lesions (2), (3), (4), (5).

Koch investigated the virus from a great variety of sources:

(a) Miliary tuberculosis (various organs investigated), 19 cases.

(b) Pulmonary phthisis, 29 cases.

(c) Tuberculosis of various organs:

Tuberculous ulceration of tongue, 2 cases.
Tuberculosis of kidney, 4 cases.
Tuberculosis of bladder and urethra, 1 case.
Tuberculosis of suprarenals, 1 case.
Tuberculosis of uterus and tubes, 1 case.
Tuberculosis of testes, 5 cases.
Solitary tubercle of brain, 2 cases.

(d) Scrofulous glands, 21 cases.

(e) Tuberculosis of joints, 13 cases.

(f) Tuberculosis of bones, 10 cases.

(g) Lupus, 7 cases.

Tuberculosis in Animals.—

17 cases in bovines.
2 cases in equines.
4 cases in swine.
1 case in sheep.
1 case in goat.
? cases in fowls.
8 cases in monkeys.
17 cases in guinea-pigs and rabbits.

Out of the great number of cases examined he demonstrated tubercle bacilli in all but two.

The next step in the experimental research was to isolate the tubercle bacilli in pure culture. This was successfully done on solidified blood serum, the preparation of which and technique of isolating cultures, he accurately described and there has been little advance made over Koch's original methods.

Now followed a long series of infection experiments with pure cultures in which practically the same results were obtained as with the tuberculous tissues used in his earlier inoculation experiments.

The chain of evidence was complete. The postulates formed by Henle for the proof of the Germ Theory of Disease, the requirements of which were so severe that he (Henle) was never able to attain them, were again expressed and fulfilled by Koch:

1. A specific micro-organism had been demonstrated which was constantly associated with the disease.

2. It had been isolated and studied in pure culture.

3. When reintroduced into healthy animals it had reproduced the disease.

Koch undertook various experiments directed toward discovering a cure for tuberculosis. Animals inoculated with pure cultures were treated with arsenic, carbolic acid, various gaseous germicides, etc., but none of these proved to influence favorably the progress of the disease.

He refers to one experiment and calls attention to its significance. A dog several months old received $\frac{1}{2}$ cc. of pure culture of tubercle bacilli from a case of miliary tuberculosis. The dog seemed ill for a long time, had distinct effusion into the peritoneal cavity and lost flesh; finally it recovered and became strong. Five months later this dog received an injection

of the same culture, but this time 2 cc. were used. For some weeks there were no symptoms of illness, then loss of flesh and ascites appeared. The animal either died or was killed after 5 weeks and extensive tuberculosis was found. The omentum, peritoneum, liver, spleen and lungs showed an extraordinary number of tubercles.

Koch says: "This experiment is of particular interest in that one dog after an injection of ½ cc. of bacillary fluid became decidedly ill, but recovered. This is the only case of tuberculosis in animals where I saw recovery take place. The hope has often been expressed that a preventive inoculation with attenuated virus will be accomplished against tuberculosis as against splenic fever. But if one successful battle with tuberculosis affords protection from a second attack of the disease, which view, by the way, is not borne out by clinical experience, this dog should have been immune against further infection. But, this was not the case, and the circumstance has a bearing against the fulfillment of the hopes referred to."

Up to the time of Koch's work there was much circumstantial evidence pointing to animal tuberculosis as a source of danger for man and the discovery of the tubercle bacillus in both human and animal tuberculosis and of the pathogenicity of the bacillus isolated from human tuberculosis for animals, gave a distinct scientific basis for the belief in this danger.

It may be of interest to see how strong a case can be made out against tuberculous cattle, both before Koch's discovery and following it by a period of about 16 years; that is until 1898 when Theobald Smith (6) differentiated the two types of tubercle bacilli.

That bovine animals may be infected with the tuberculous material from human beings, though sometimes with difficulty, has been abundantly shown both before and since Koch's London address. Chauveau (7) was perhaps the first and a long list of names has been added to his, of experimenters who have succeeded in infecting bovine animals with human tuberculous material.

The only case of direct intentional inoculation of man with the virus of bovine tuberculosis, so far as I have been able to find, is cited by Bovaird (8), who says that "Kohler has, however, recalled the fact that as long as 20 years ago Rokitansky, influenced by the supposed antagonism between tuberculosis and cancer, inoculated a number of incurable cancer patients with bovine tuberculosis. Most of these patients lived many months or a year after the inoculation. Some of them developed small, local, quickly-healing ulcers, but at autopsy none of them showed tuberculosis."

There are on record, however, a number of cases in man where the circumstantial evidence points strongly to infection of bovine origin. These may be divided into two groups.

Group I. Cutaneous Infections.

Case 1.—Tscherning (9) reports the case of a veterinarian who, while performing an autopsy on a tuberculous cow cut his thumb slightly with a scalpel. The wound healed, but three weeks later the neighboring parts became swollen and movement of the thumb painful, suppuration ensued and at this time it was thought not to be of a tuberculous nature. The condition grew worse, however, and at the end of 2½ months the lesion was extirpated and on microscopic examination proved tuberculous, by the demonstration of tubercle bacilli in the tissues.

Tscherning reports also a case in which a servant cut his thumb with a broken glass cuspidor which had been used by his tuberculous master. After several months it was necessary to amputate the thumb and remove the glands at the elbow and axilla.

Histological examination of the tissue and demonstration of the bacilli proved this case tuberculous.

The author contrasts these two cases and points out that the inoculation of virus from human source was accompanied by more serious results than in the case where the virus was of bovine origin.

Case 2.—L. Pfeiffer (10), reports the case of a veterinarian, "M," 34 years old, of a healthy family. In the summer of 1885, while performing an autopsy on a tuberculous cow, he suffered an injury to the left thumb, the knife probably entering the joint. The wound healed *per primam*. In the course of 6 months there developed a skin tubercle in the cicatrix, and the joint became stiff. In the fall of 1886 an attack of pharyngitis was followed by hoarseness, cough, expectoration. Tubercle bacilli were found in the sputum. In January, 1887, examination of the lungs showed infiltration of the right lower posteriorly. Sweats and diarrhœa with death ensued 1½ years after the injury.

The axillary glands were not involved. On opening the joint which was the original seat of the injury, the cartilage was found necrotic, the cavity filled with dry exudate which, on microscopic examination, was found to contain large numbers of tubercle bacilli.

Case 3.—Smith (11) quotes case reported by Coppez. A girl 17 years old had a wound on the palmar aspect of the third finger between the second and third phalanx which became infected with tubercle bacilli while milking. The original lesions gave rise, within 6 months, to over 35 subcutaneous abscesses situated in different parts of the body. Subsequently more appeared, in all 60-66. At no time could any visceral lesions be recognized, but one eye became involved. The nature of the affection was demonstrated by inserting some pus from an abscess into the eye of a rabbit.

Cases 4, 5, 6 and 7.—Ravenel (12) reports 4 cases of cutaneous tuberculosis which he has observed, all occurring in veterinarians who received skin wounds, three of them while performing autopsies on tuberculous cows, one while performing an autopsy on a goat which had been infected with bovine tubercle bacilli. All of these 4 cases developed skin lesions which were subsequently excised and their tuberculous nature proved by histological examination of the tissue, inoculation or demonstration of the tubercle bacilli in sections.

Case 8.—M. B. Hartzell (13) reports a case occurring in a man who received a slight injury on the hand while cleaning cattle cars. The trifling wound at first healed promptly but later became slightly painful, swollen and finally developed into a form of lesion known as tuberculosis cutis verrucosa. The patient at this time was in excellent general health, weighing about 175 lbs., and so far as could be learned, had never been seriously ill. Under appropriate treatment the primary lesion healed permanently, but a year later an examination of the patient showed emaciation, persistent and frequent cough, expectoration, elevation of temperature, and decided dullness at the apex with numerous râles.

Case 9.—Ravenel (5) quotes the following case by Troge which is regarded as especially convincing: A young butcher in good health, and with no hereditary taint, wounded his right forearm slightly while working on a tuberculous cow. The wound healed under treatment, but 6 weeks later showed signs of inflammation, and a tubercle formed on the internal face of the elbow. There

were two small fistulæ on the forearm, and enlargement of the ulnar and axillary lymph glands. A month later the middle forearm was covered with granulations, which steadily increased in area, and in spite of treatment, at the end of two months assumed the character of lupus. Histological examination at this time proved the tuberculous character of the disease. Two years after the injury Troge found an abscess which extended deep into the muscular layers. The pus contained tubercle bacilli, and the tissues showed typical tuberculous lesions. Some months after the glands of the left axilla and subclavicular space were extirpated, and proved to be tuberculous. All possibility of infection from human sources was excluded by Troge.

Case 10.—Ravenel (12) states that the death of Mr. Thomas Wally, Principal of the Royal Veterinary College of Edinburgh, is also attributed to infection gaining entrance through a wound received while making an autopsy on a tuberculous cow.

Cases 11, 12, 13, 14, 15 and 16 are all cited by Ravenel (12).—"Dr. Kurt Mueller, a surgeon of Erfort, describes the cases of two healthy young men who were under his care. Both were butchers, and in both cuts were sustained while working on tuberculous cattle, the wound opening the synovial sheath of a tendon in the hand. In each case an operation was necessary, and it was found that the wall of the sheath, as well as the tendon itself, was thickened, while upon them were large numbers of yellow nodules, proven to be tubercles by miscroscopic examination. These tubercles were placed very thickly near the scar, gradually becoming fewer as the scar was left. In one of the men the trouble extended from the finger to the forearm, and there was some evidence of tuberculosis even at the muscular attachment of the tendon. In the second case the tendon was attached to the sheath, and the disease limited to an area 10 cm. in length. Examination of the removed tissue proved the presence of tubercle bacilli. Both of these men had good family histories, and were free from tuberculosis elsewhere, so that Dr. Mueller has no doubt that they were inoculated with bovine tubercle bacilli."

Case 13.—"De Jong observed the case of a man who injured his finger while examining the mesentery of a tuberculous cow. The wound did not heal, the edges became indurated, and considerable swelling ensued, with pain which increased steadily and failed to yield to ordinary treatment. Curettage and cautery were finally used with success. In the scrapings tubercle bacilli were demonstrated."

Cases 14, 15 and 16.—"Drs. Joseph and Trautmann report three cases of verrucose tuberculosis of the skin occurring among employes of the municipal abattoir in Berlin, who worked exclusively with tuberculous animals."

"J. G., aged forty-five years. Was never ill before, and no tuberculosis in his family. His duties were to cut up tubercular and condemned carcasses. In 1892 or 1893 he received a small wound of the middle finger of the left hand, and a nodule soon formed, surrounded by a zone of redness. It increased slowly until 1897 or 1898 when the thermocautery was resorted to with partial success. About a year ago the man tore the first finger of the same hand on a bone from a tubercular cow. The wound cicatrized in about eight days, but later a nodule developed on the site. When examined, in August, 1891, the disease was confined to the first and middle fingers of the left hand. On the first finger nodules about the size of a pea protruded from the surface 1 mm. to 2 mm., moderately red, and having in the center a broken area covered with small crusts. The nodule on the middle finger was much larger and the verrucose condition more developed."

"J. O., aged thirty-five years. No history of tuberculosis in family. The patient, his wife, and three children had always been healthy. Has been employed in the abattoir for one year, and always in division reserved for tuberculous animals. Three months before he had suffered a wound of two fingers, following which the disease developed. On the little finger is a hard, rough, thickened area, extending entirely through the skin. On one side is an ulcer which goes deep into the corium."

"K. S., aged thirty-eight years. Employed in handling tubercular material. He showed a typical tuberculosis of the skin. As the case was being treated by another physician, the details are not given."

Group II. Alimentary Infection.

Cases 1, 2 and 3.—Ernst (4) quotes a very interesting case, which as he points out, illustrates that the danger from the consumption of milk from tuberculous cows was appreciated by individuals at least before the announcement of Koch's discovery.

The extracts are from a letter written by a veterinarian of Providence, R. I., and are so interesting that they are given in full.

"Mr. W., June 15, 1878, called me to see a white and red cow which coughs and is short of breath and wheezes. Pulse 60; respiration 14, and heavy at the flanks; temperature 104°. Diminished resonance of right lung, but increased in part of the same. Emphysematous crackling over left lung and dulness on percussion. Diagnosed a case of tuberculosis and advised the destruction of the animal."

"December 12.—Cow in a cold rain a few days ago for about two hours. Milk still more diminished than at a visit made on September 25. Again advised the destruction of the cow. Family still using the milk. Respiration 20; pulse 85; temperature 104.6°."

"February 22, 1879.—Temperature 104.8°; respiration 26; pulse 68. Losing flesh fast. Milk still in small quantities. Advised, as before, to destroy the animal and not to use milk."

"May 30.—Called in a hurry to see cow. Is now as poor as could be. No milk for a week. Pulse 80; respiration 40; temperature 106°. The cow died in about three hours. Autopsy made fourteen hours after death: Lungs infiltrated with tuberculous deposit. Weight of thoracic viscera 43.5 lbs. Tuberculous deposits found in the mediastinum, in the muscular tissues, and in the mesentery, spleen, kidneys, udder, intestines, pleura, and one deposit on the tongue. The inside of the trachea was covered with small tubercles."

"In August, 1879, the baby was taken sick, and died in about seven weeks. On post-mortem of the child there was found meningeal tuberculosis—deposits all over the coverings of the brain and some in the lung."

"In 1881 a child, about three years old died with, as it was called, tuberculous bronchitis. And in 1886, a boy, nine years old, who for three or four years had been delicate, died with consumption,—'quick,' as it was called."

"So far as known, the family on both sides have never before had any trouble of the kind, and the parents were both rugged and healthy people, and so were the grandparents—one now being alive and sixty-eight years old, and the other died at seventy-eight."

Cases 4, 5, 6, 7 and 8.—Adami (3) cites the following cases: He writes: "Demme records a case of four infants in the Children's Hospital at Berne, issue of sound parents, without any tuberculous ancestor, who died of intestinal and mesenteric tuberculosis as the result of feeding on the unsterilized milk of tuberculous cows. These were the cases in which he was able to exclude the possibility of other causes for the disease and decided that the milk alone was to blame."

The Cattle Commissioners of Massachusetts give reference to a case of an infant, son of a college mate of one of their body, a comparatively strong healthy child of twenty-one months, who, visiting a relation for a week, drank unsterilized milk of a cow which was soon after condemned and killed in a state of generalized tuberculosis; this child died three months later with

mesenteric tuberculosis. Only distant relations had died of this disease and the child had seen but one of these and that for short intervals. A second child of the same family brought up on sterilized milk remained in robust health; the parents were free from the disease. Even in a case like this, convincing as it seems, more information is required with regard to the nurse and servants of the household, the possible existence of any case of tuberculosis in the house of the relation visited and so on."

CASES 9, 10, 11, 12, 13, 14, 15, and 16.—Eber (14) cites the following cases: Baum collected the cases of tuberculosis of man contracted through animals in 1891. Among these cases the most interesting ones are the following:

A 14 years old girl of healthy parents, in her youth perfectly well, died of tuberculosis of the larynx which had spread to the ileum and cecum and to a slight extent to the lungs. It appeared that the girl had drunk plentifully of warm cow's milk which was obtained from a cow which had extensive tuberculosis (Hermsdorf).

A child of healthy parents which had thrived during the time it was nourished by its mother, soon became ill after being weaned and died of acute tuberculosis of the brain. The milk which the child drank came from tuberculous cows. After taking the same milk, another child from different parents died likewise of acute tuberculosis of the brain (Leonhardt).

At the autopsy of a 6-months old child whose parents were perfectly healthy, brain tuberculosis was found. The child had as nourishment only taken the milk of a tuberculous cow (Sonntag).

A boy of four or five years had taken milk, warm from a cow, which later on autopsy proved to be definitely tuberculous. This boy became sick and died of tuberculosis of the mesentery and tuberculous lymphadenitis and pulmonary tuberculosis (Stang).

Johne reports a case. He obtained the breast and abdominal viscera of a highly tuberculous cow with a note that this animal had up to a few weeks previously been the most beautiful and best nourished animal in the stables, then became very much emaciated. On account of its very healthy condition previous to its illness the owner had used the milk to nourish his newly born child. Johne felt it his duty to report to a colleague, who stated to the father of the boy that the cow had extensive tuberculosis, and that he should look after the health of the child; the colleague learned later that the child following an attack of measles had catarrhal inflammation of the lungs and that it was apparently falling off in its nutrition. A short while after Johne was informed that the child 2½ years old had died of miliary tuberculosis of the brain. The other children of the family had remained perfectly healthy (Johne).

A case very similar to this is reported by Prümers in a brewer's family at Koblenz. Two children were nourished with the raw milk of a cow which was considered perfectly healthy and which had been fed with particular care. The children died of tuberculosis before they had attained their third year. The parents as well as the grand-parents of the children were healthy. The cow showed after being killed an extensive tuberculosis (Prümers).

CASES 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30.—Ravenel (12) cites the following cases: "One of these cases reported by Gosse, of Geneva, is so strong that Nocard has well said, 'It has almost the value of an experiment.' Gosse was a physician himself and the son of a physician. His own daughter was infected by drinking the milk of a cow with tuberculosis of the udder on his own farm, and he had the remarkable courage to perform a post-mortem examination and give the results to the scientific world."

"Bang, through inquiries in Denmark, has collected reports of nine persons in whom infection could be traced with reasonable certainty to milk from tuberculous cows."

"Von Ruck reports the cases of a father and child which are very convincing and says that he has observed several others in which there was very good reason to believe that milk was the agent of transmission for the tubercle bacillus."

"Klebs and Rievel have recently reported two cases which came under the observation of the former. A healthy young man, employed by Klebs to assist in making some investigations on milk infection had the habit of drinking the milk of the tuberculous cows used in the experiment. In a few months he died of miliary tuberculosis. The second case was one of six male children, who died at the age of two years of tuberculosis of the cord and meninges. This child was the only one of the six fed on cow's milk and the only one that developed tuberculosis."

CASES 31 and 40, inclusive. Bovaird (15) quotes among others the following cases:

"Law relates the case of a strong vigorous boy of 1½ years who for a week drank the milk of a cow which was shortly after condemned and killed in a state of generalized tuberculosis. In 6 weeks the child was noticeably falling off and in 3 months died, a mere skeleton, with tuberculosis of the abdomen. The father could trace no tuberculosis in his near ancestors, but the mother's father and uncle had died of it. She herself was in perfect health."

"Ollivier reports 13 cases of tuberculosis, 4 of them primary in intestine, in a school supplied with milk from a tuberculous cow. Brouardel reported that in a boarding school in which there were 14 girls, 5 contracted tuberculosis from drinking the milk of a tuberculous cow."

Sladen (16) quotes Woodhead as the authority for the statement that in a dairy in Scotland, 3 cows were found to have tuberculosis of the udder. In the institution to which this milk was supplied the mortality from tuberculosis during the last year was 30 per cent, and during the preceding year, 40 per cent of the total mortality.

In many of the cases in Group I where the infection occurred in veterinarians, while performing autopsies on tuberculous cattle, the evidence that the primary lesion was due to inoculation with bovine tubercle bacilli may be accepted as conclusive. That pulmonary or other forms of tuberculosis developing subsequently, were consequent upon the bovine infection cannot be affirmed with the same certainty in the case of a disease so prevalent and to which exposure from various sources is so common. While the cases of Group II scarcely furnish so convincing evidence as do those of Group I, they are of much more importance since a comparatively small number of people are exposed to risks of skin inoculation while an enormous number of individuals are exposed to whatever dangers lie in drinking tuberculous milk.

This can be appreciated when one considers that in England 30 per cent of all the milk cows, according to McFadyean (17) are estimated to be tuberculous. The figures for this country are not so accurately known but perhaps, 10-15 per cent represents the number. A. D. Melvin, Chief of the U. S. Bureau of Animal Industry (Internat. Congress on Tuberculosis, Washington, 1908), states that reports of tuberculin tests made in the 15 years from 1893 to 1908 by federal, state and other officers with tuberculin prepared by the Bureau of Animal Industry have been carefully analyzed and tabulated. Out of 400,000 cattle tested (mostly dairy cattle) there were 37,000 reactions or 9.25 per cent.

As to the reliability of the test he states that out of 23,869 reacting cattle slaughtered, lesions of tuberculosis were found in 23,583, a percentage of 98.81. That all of these are excreting tubercle bacilli in their milk cannot be taken for granted. Those with tuberculous lesions of the udder are to be regarded as most dangerous, although the others are a possible source of danger since it has been shown that tubercle bacilli may be present in the milk of tuberculous cows even though they have no discoverable lesion of the udder. Numerous investigations have been undertaken to determine the frequency of occurrence of tubercle bacilli in market milk. Hess (Internat. Congress on Tuberculosis, Washington, 1908) reports the results of tests carried out on milk in New York City. One hundred and seven specimens were tested by inoculation into guinea-pigs and 17 specimens (16 per cent) contained tubercle bacilli.

I have been able to find no well authenticated case in man of infection from cattle, through the respiratory route. Although, the possibility of this has been suggested, its demonstration necessarily will remain difficult.

The attempt has been made to throw light on the relationship of bovine to human tuberculosis by pathological studies.

The fact that intestinal and mesenteric gland tuberculosis occur most frequently in children at the age when milk forms the most important article of diet, considered with the further fact of the widespread existence of tuberculosis among dairy cattle is a significant coincidence.

If it can be proven that the lesions are primary in the intestine in a considerable percentage of cases, the coincidence becomes more significant.

That this is not an essential link in the chain of evidence, however, is shown by Ravenel (5) and others who have proven that tubercle bacilli may pass through the intestinal wall without producing any demonstrable lesion. Thus the primary lesion may be tuberculosis of the mesenteric lymph nodes, or even in more remote parts of the body. Theobald Smith (11) says: "With the two facts before us that tubercle bacilli gravitate, as it were, towards the lungs in all the susceptible mammals, and that they may conceal their movements in the body quite effectually, we must regard infection through the digestive tract, as a source of phthisis at least deserving attention."

Nor is it enough to consider the intestine alone as furnishing a portal of entry for ingested tubercle bacilli. Ravenel (18) and others have demonstrated that infection may (perhaps frequently does) take place through the tonsils.

On the other hand, even when the primary lesion can be demonstrated in the intestine and even though it be the only focus of infection in the body, it does not by any means prove infection of bovine origin. There are abundant opportunities for tubercle bacilli from human sources to get into the intestinal canal. The contamination of food with dust, or by flies which have fed on phthisical sputum; the introduction of the bacilli in the mouth, by soiled hands, especially in children; and numerous other ways which readily suggest themselves are common.

Autopsy Statistics.

Koch in his London address states that, in the many cases of tuberculosis examined after death, he remembers having seen primary tuberculosis of the intestine only twice. He says that among the great post-mortem material of the Charité Hospital, in Berlin, 10 cases of primary tuberculosis of the intestine occurred in 5 years. He quotes Baginsky as never having found tuberculosis of the intestine without simultaneous disease of the lungs, and bronchial lymph glands, among 933 cases of tuberculosis in children at the Emperor and Empress Frederick Hospital for Children in Berlin.

Biedert observed only 16 cases of primary tuberculosis of intestine among 3104 post-mortem examinations of tuberculous children.

In striking contrast to these are the reports of Still (19), who in 269 consecutive cases of tuberculosis among children under 12 years of age, at the Great Ormond St. Hospital for Sick Children in London, found 53 cases of primary intestinal origin and 10 cases of probable primary intestinal origin, forming when taken together, 23.4 per cent of the total number of cases of tuberculosis in children.

Dr. Shennan (cited by McFadyean (17)) finds from the autopsy records of the Royal Hospital for Sick Children in Edinburgh, that 28.1 per cent of the cases of tuberculosis among children are af primary intestinal origin.

The conclusions drawn by Sir Richard Thorn (20) (The Harbin Lectures, 1898), reviewing the statistics for England during the last 50 years are most interesting. He points out that the mortality from tuberculosis in all its forms, including phthisis, had fallen at the rate of 45 per cent to 60 per cent at different ages, whereas in the case of infants under 1 year of age, not only did this gain disappear in so far as tabes mesenterica was concerned, but that there was an increase in the mortality from this disease of 27.1 per cent.

It is his belief that the great decrease in the general death rate from tuberculosis in England during the past 50 years is attributable to the improved sanitary conditions which have obtained, but the increased mortality from tabes mesenterica in children under 1 year of age, he ascribes to the steady increase in the use of cow's milk in a country where it is estimated that 30 per cent of all dairy cattle are tuberculous.

McFadyean (17) points out several weak points in this argument. He says: "Perhaps the weakest of all is the assumption that the deaths certified under the head of tabes mesenterica correspond closely with those which the pathologist would classify as cases of primary alimentary infection.

"It is scarcely possible to doubt that the term tabes mesenterica in the Registrar-General's return covers a heterogenous collection of cases of which the majority may not be cases of tuberculosis at all, but even if it is agreed to accept all of the cases registered under the head of tabes mesenterica as instances of primary alimentary infection, the figures found in the Registrar-General's returns do not support the contention that milk is responsible for all of the cases of tabes. It is true that they indicate an increase in the death rate from alimen-

tary tuberculosis among children under 12 months old but on the other hand there appears to have been a considerable decline in the death rate from the same cause at all ages between 1 and 5 years.

"Now, if tuberculous milk were a frequent cause of tuberculosis, one would not have expected the death rate from that cause to decline among children between 1 and 5 years of age, for there is no reason to suppose that there has been any decline in the use of cows' milk in the feeding of children at that age during the last 50 years. The fact appears to be that the Registrar-General's returns do not afford much trustworthy information with regard to the number of cases of primary alimentary tuberculosis, and are absolutely worthless as an indication of the extent to which human beings are infected by means of milk."

A glance at the above statistics shows that there is a great lack of unanimity in the results obtained. It seems likely that this disagreement is due largely to a difference in interpretation of the results of autopsy findings. One seems justified in concluding from them, however, that among children dying of tuberculosis, a not inconsiderable proportion of them have gotten the primary infection through the alimentary tract, and when one considers the frequency with which tubercle bacilli are found in cows' milk and the important element milk is in the diet of children, they point rather strongly to tuberculous milk as an important etiological factor in human tuberculosis.

On the other hand there are certain reports which perhaps detract somewhat from the value of these statistics.

Kitisato (21) states that in Japan it is a fact of common knowledge that the native cattle are free from tuberculosis under ordinary conditions. The mortality statistics show that during the two years, 1899-1900, 1,842,831 people died. Of these 139,380 died as result of tuberculosis, or 7.56 per cent of the total mortality. He quotes from Tamaye Ogiya, working under the directorship of Prof. Sata from the Pathological Institute at Osaka. This authoress states that during a period of $3\frac{1}{2}$ years she has found among 250 autopsies, 116 cases of tuberculosis, amounting to 46.4 per cent of the total. Of the tuberculous patients 20 (17.3 per cent) were under 18 years, 96 (82.2 per cent) were more than 18 years. Among these patients she found 90 (77.6 per cent) showing primary pulmonary tuberculosis, 12 (10.34 per cent) who had primary intestinal tuberculosis. Among the latter 6 were more than and 6 less than 18 years.

Basing the statement upon this paper it may be said that the occurrence of primary intestinal tuberculosis is not rare in Japan, either among adults or children, although cows' milk is employed but little in this country for the nourishment of children. To show to what a small extent milk is used in Japan, Kitisato makes the following interesting calculation. He states that one cow in Japan furnishes in the course of a year a daily average of 5 liters of milk. Calculating the total production of milk in Japan and dividing this by the population he finds the per capita allowance of milk in all Japan is 2.825 cubic centimeters.

Baldwin (22) says, "The same conditions concerning the use of milk are alleged to exist in Greenland (Djier), the Gold Coast (Fisch), China, the Philippines, Turkey, Sicily and Sardinia. Yet, in all these countries tuberculosis is prevalent in all forms and to the same extent as in Europe and America."

The principles of immunity have been resorted to, in various attempts to solve the problem of the relationship between human and bovine tuberculosis. For example, the subcutaneous inoculation of cases of tuberculosis in man with tuberculin made from the human type of bacillus and with tuberculin made from the bovine type of bacillus. No constant characteristic difference could be made out in the reactions obtained however, which would throw any light on the type of bacillus present in a given case.

More recently Detre (23) claims to be able to determine in cases of tuberculosis which variety of bacillus is present by inoculating, according to the cutaneous method of v. Pirquet, simultaneously with human and bovine tuberculin. He thinks that the tuberculin giving the more marked reaction corresponds with the variety of bacillus present.

The large proportion of phthisical cases in which Detre found the reactions practically equal (19 per cent) and ascribed to a double infection (human and bovine) seems to cast much doubt on the value of the test. The work is too recent to have received the necessary confirmation, and others, working independently along the same lines, before Detre's publication, obtained results which are not fully in accord with those of Detre.

Some light may come from therapeutic uses of the two kinds of tuberculin. Nathan Raw (24), going on the assumption that certain forms of tuberculosis are caused by infection with the bovine type of bacillus, and that other forms are due to the human type of bacillus; and the further assumption that an infection with one type gives a greater or less degree of immunity against infection with the other type, uses tuberculin made from the bovine bacillus in the treatment of those cases in which he thinks the infection is due to the human bacillus, and he uses tuberculin made from the human type of bacillus in the treatment of cases which he supposes to be of bovine origin.

The evidence coming from the therapeutic test will necessarily be slow in accumulating and time must develop what light this procedure will throw on the question.

Agglutination Reaction.—Arloing and Conrmont (25) have investigated the agglutination reaction of the sera of tuberculous patients with reference to the two types of bacilli. While differences were noted they were not sufficiently constant to apply to the determination of the type of infection present. Furthermore, differences in the agglutination reaction of a given serum for two or more strains of the human type of bacillus were sometimes greater than existed for two strains, one human and the other bovine.

None of these methods of approaching the question, however, have been entirely satisfactory; they throw light on the

subject and are valuable as circumstantial evidence, but they lack the exactness of scientific laboratory experiments.

A new method of approaching this all-important problem was furnished, by the differentiation of tubercle bacilli into two types, the *typus humanus* and *typus bovinus*. The recognition of these two types is due to the work of Theobald Smith (6), whose important communication was made in 1898. The distinction which he made has since been recognized by the British Commission, the German Commission, the workers in the Bureau of Animal Industry in Washington and many other men of the highest authority.

It is not necessary here to go into the details of this differentiation. The distinction is made on differences of pathogenicity, morphology, staining reaction, cultural and biological characteristics. It seems strange that Koch did not recognize these differences at the time of his original publication, in 1882, as he worked with cultures from a great variety of sources both human and bovine, and states that he studied them with this point especially in view, but was unable to recognize any differences.

Difference in virulence was, however, noted at an early time. The difficulty of producing tuberculosis in cattle with material from cases of human tuberculosis was reported by numerous investigators, some even denying the possibility of doing so, among whom Koch in his London address (1901) took the most radical stand, affirming that the disease in human beings and bovines was totally different and denying almost utterly the communicability either from man to bovines or from bovines to man. This radical departure called forth a storm of opposition from the other members of the congress. It was admitted that difference in virulence did exist between human and bovine tuberculous materials and in pure cultures isolated therefrom, but the consensus of opinion at that time seemed to be that this difference was perhaps due to the influence exerted on the bacillus by residence in a particular host or repeated passage through certain animals.

Lister (26) pointed out the change in virulence for cattle which the virus of small-pox underwent in the human host and thought it might be analogous to what took place in tubercle bacilli residing in man.

Subsequent work, however, has not upheld this view. The German Commission taking the most radical stand, maintains that the characteristics of the two varieties (human and bovine) are firmly fixed and that mutations never occur.

The British Commission, Theobald Smith, Ravenel and others, while agreeing that the characteristics are quite firmly fixed in the two types, are not so positive that changes in virulence never occur. They have all observed cultures, usually of human origin, which at first showed the characteristics of the less virulent, more eugenic type, undergo an increase in virulence on repeated passage through animals.

Several possible explanations of these variations have been advanced.

1. That the original cultures contained both types of bacilli but that the characteristics were determined by the preponderance of the less virulent, but more luxuriant, human tubercle bacilli. On passage through animals resistant to the human bacilli, however, the bovine type was largely or solely the one which survived.

2. The second possibility is that mutation occurred and an organism originally of low virulence was influenced in some way by residence in an unusual soil so as to heighten its virulence. Theoretically this is perhaps a not altogether unreasonable explanation.

It seems highly probable that the two types have descended from a common ancestor and that they have been differentiated from each other by long continued differences in environment. It is even conceivable that this process is still going on to some extent, and if so, organisms which had certain characteristics impressed on them comparatively recently, might with relative ease lose such recently-acquired characteristics.

These cases must be regarded as rare, however. The British Commission having recorded but 5 cases in which the characteristics seemed unstable. Ravenel, Theobald Smith and a few others record instances, while the majority of cultures adequately studied have possessed characteristics which remained remarkably constant.

Koch calls attention to the constancy of the cultures studied by him even after more than a year of artificial cultivation.

The British Commission think it possible that in rare instances cultures undergo slight variations but on the whole that they are stable. Theobald Smith, Ravenel and others think that the characteristics are sufficiently constant to mark two distinct types.

The German Commission, as stated above, hold that mutation does not occur. Their position in the matter is interesting. That in a certain proportion of cases among humans, bacilli of the bovine type are found, they admit; holding however, that these are responsible only for the milder forms of intestinal and mesenteric node tuberculosis and do not produce the fatal forms such as generalized or pulmonary tuberculosis.

In cases of extensive tuberculosis in which the bovine tubercle bacilli are isolated they maintain that the severe lesions are produced by human tubercle bacilli, while the bovine tubercle bacilli remain localized in the intestine or neighboring lymphatics.

Let us now turn to the cases recorded in which the type of bacillus present has been determined by exact bacteriological methods.

The British Commission (27) has studied the nature of the tuberculous material obtained from 60 cases of the disease in man. These they separate into three groups as follows: Group I consisted of 14 cases in which bacilli of the bovine type were found, made up as follows: The bacilli in one case were isolated from the sputum; in 3 cases from tuberculous cervical glands removed by operation, and in 10 cases from mesenteric glands of cases of primary abdominal tuberculosis. All of the cases of abdominal tuberculosis occurred in children and showed some distinctive feature demonstrating the primary origin of the disease.

Group II consisted of 40 cases in which bacilli of the human type were found. The cases forming this group consisted of various forms of tuberculosis, including cervical lymph glands removed at operation, 8 cases of mesenteric glands removed after death from cases in which the disease seemed to be of alimentary origin. In 10 instances the material consisted of lungs or bronchial glands from cases in which the disease was of respiratory origin, namely pulmonary tuberculosis. One case was that of a tuberculous kidney and one case of tuberculous testes. Nine were cases of tuberculous affections of the bones or joints.

Group III consisted of 5 cases which yielded bacilli occupying a position intermediate between the human and bovine type. This group does not form a group in the sense in which the cases of Group I, and Group II form a group.

In Group I and Group II the cases in each group differ so little from each other as to form an almost homogeneous group. In Group III the cases differ widely from each other, and are grouped together for consideration on account of their exceptional features. Were it not for these exceptional features some might be placed in Group I, others in Group II. The following is a brief abstract of the report on these five exceptional cases.

Case H. 53 "D. H." Lupus. The tubercle bacilli showed intermediate virulence.

Case H. 49 "T. C." Primary abdominal tuberculosis. The original culture exhibited a virulence slightly below that of bovine bacilli, but the second culture (after passage through calf) showed full virulence. After repeated subculturing on serum it lost its virulence for cattle.

Three other cases are placed in Group III because on repeated passage through calves they assumed the virulence of bovine tubercle bacilli although when originally isolated they had all the characteristics of the human type.

The German Commission (28) has studied cultures from 84 cases of tuberculosis in children; in 63 of which it found tubercle bacilli of the human type and in 21 bacilli of the bovine type.

Their results are tabulated in convenient form below:

Origin of material investigated.	Form of tuberculosis present.	No. cases investigated.	Type of bacilli found.	
			Typus humanus	Typus bovinus
Autopsy material	Pulmonary tuberculosis (phthisis, caseous pneumonia, caseous bronchitis); general miliary tuberculosis; tuberculous meningitis	18	18	..
	Primary intestinal and mesenteric gland tuberculosis	20	7	13
	Case of general miliary tuberculosis in which the portal of entry could not be determined	1	..	1
Material removed at operation	Cervical gland tuberculosis	16	10	6
	Tuberculosis of bones and joints	27	26	1
	Tuberculosis of axillary glands	1	1	..
	Skin tuberculosis (Lupus)	1	1	..
		84	63	21

To the above list of cases two cases of double infection (human and bovine) must be added.

(1) H. 38. Caseous and calcified mesenteric glands. Circumscribed fibrous peritonitis. Conglomerate tubercles of the spleen. Miliary tubercles of the splenic capsule and of the left pleura.

(2) H. 74. Intestinal ulceration. Caseous mesenteric glands. Tuberculous meningitis.

From the mediastinal glands bacilli of the bovine type were recovered. From the meninges and from the microscopically unaltered bronchial glands, bacilli of the human type were recovered.

In a series of 54 cases of tuberculosis in adults, bacilli of the human type were found in every case. In one of the 54 cases bacilli of both the human and bovine type were present. These cases are tabulated below:

Form of tuberculosis.	No. of cases investigated.	Type of bacilli found.		
		Human.	Bovine.	Avian.
Pulmonary tuberculosis	22	22	..	
General miliary tuberculosis	2	2	..	
Primary intestinal and mesenteric gland tuberculosis	6	6	1	
Tuberculosis of the peritoneum	3	3	..	
Tuberculosis of the retroperitoneal glands	1	1	..	
Tuberculosis of the bronchial and mesenteric glands	1	1	..	
Tuberculosis of the pericardium, pleura and peritoneum	1	1	..	
Tuberculosis of the cervical glands (operation material)	2	2	..	
Tuberculosis of the bones and joints (9 operation material)	11	11	..	
Urogenital tuberculosis	2	2	..	
Ileocecal tumor (operation material)	1	1	..	
Tuberculosis of the mucous membrane of the mouth	1	1	..	
Skin tuberculosis (tuberculosis cutis verrucosa)	1	1	..	
	54	54	1	
Tuberculosis in Animals.				
Bovine	13	..	13	..
Swine	8	..	7	1
Sheep	1	..	1	..
Hens	12	..	..	12
Pigeons	1	..	..	1
Pheasants	1	..	..	1
Parrots	2	2	..	..
	38	2	21	15

In addition to these cases studied by the British and German Commissions there are reports in the literature of smaller series of cases, in which, however, the type of bacillus present has been satisfactorily worked out.

Lewis at the International Congress on Tuberculosis, held in Washington (1908), reported a series of 15 cases of cervical gland tuberculosis in which he had worked out the bacteriology. The cultures were obtained from the glands removed at operation. Of the 15 cases studied, 9 yielded cultures of the bovine type and 6 of the human type.

Duval, of Montreal (International Congress on Tuberculosis in Washington, 1908), reported studies on the bacilli recovered from four cases of cervical adenitis. In one he found the bovine type of bacillus present, in one the human type. The bacilli present in the other two cases he regards as intermediate in type.

History of culture "BB" obtained from mesenteric glands

of child dead of tuberculous meningitis. The pathologist who performed the autopsy says that this case "is the clearest one of primary intestinal tuberculosis ever seen by him".

The culture morphologically and culturally, says Ravenel, corresponds more nearly to the bovine type than to the human and possessed great pathogenic power for cattle. A second culture designated "U" obtained from the mesenteric glands of a child whose death was due to tuberculous meningitis, has shown a virulence far in excess of that usually found in human cultures, though it falls short of culture "BB" in pathogenicity. This culture when first isolated was considered by Ravenel a typical human culture, but later after 12 subcultures on glycerine agar, it was shown to have sufficient virulence to kill a calf. Smith (27) regards this culture probably human tubercle bacilli.

Culture "M" isolated from human sputum showed marked increase in virulence during passage through a number of calves.

Fife and Ravenel (30) report a case of tabes mesenterica due to the bovine tubercle bacilli.

Smith (6) records his observations on 7 cultures obtained from phthisical sputum and 6 cultures of bovine origin.

All of the human cultures resembled each other, and all of the bovine resembled each other. The difference between the human and bovine was considered by Smith to be sufficiently well marked to justify the establishment of two varieties. From his studies on these cultures we may conclude that in case of all the cultures obtained from human sputum the human type of bacilli was present, and all of the bovine culture consisted of the bovine bacilli.

Smith (31) reports a study of the tubercle bacilli isolated from 3 cases of tuberculosis of the mesenteric lymph nodes. In all these cases the anatomical findings at autopsy pointed to probable primary intestinal infection, but the bacilli isolated in all three cases proved to be of the human type.

He also (29) reports the study of the tubercle bacilli from 2 cases of primary tuberculosis of the mesenteric glands in children; in one of which he found bovine tubercle bacilli, while in the other human tubercle bacilli.

Lartigau (32) studied cultures from 19 human sources and found one culture which he considered according to Theobald Smith's classification, bovine in origin.

Vagades (33) studied the virulence of tubercle bacilli from 28 human and 2 bovine sources. The human cultures were all obtained from sputum, or lungs at autopsy, except in one case which was a culture isolated from a gland. One of these cultures (obtained from the lungs at autopsy) showed morphological and cultural characteristics similar to bovine tubercle bacilli and a pathogenicity for rabbits equal to the bovine bacilli. Smith (29) considers it bovine.

Fibiger and Jensen (34) report a study of the tubercle bacilli isolated from five cases of intestinal tuberculosis, two occurring in adults and three in children. The authors conclude on a basis of the virulence of the bacilli for cattle, that the bacilli from the three cases in children were of the typus bovinus.

They (35) report investigations on the bacilli from five more cases, in three of which they regard the evidence of primary intestinal infection as conclusive and in the other two as very probable, although at autopsy, slight lesions were found in the lungs in addition to the intestinal lesions. In two out of these five cases bacilli fully virulent for cattle were found.

The same authors (36) report two further cases of primary intestinal tuberculosis occurring in children from which they isolated bacilli highly virulent for cattle.

Westenhoeffer (38) has reported a case of primary intestinal tuberculosis in a four-year old girl, material from which when inoculated into a calf, set up a progressive generalized tuberculosis.

Ebers (39) has carried out extensive and careful inoculation experiments on calves with tuberculous material obtained from five cases of intestinal and mesenteric gland tuberculosis in children. From two of these cases bacilli were obtained of such a grade of virulence for cattle that they may be regarded as belonging to the typus bovinus.

de Schweinitz, Dorset, and Schroeder (40) have investigated cultures from nine cases of human tuberculosis, of which they give the histories. Five of these cultures were obtained from the lungs or sputum of cases of pulmonary tuberculosis; two from mesenteric glands and two from peritoneal tubercles. All were passed through guinea pigs before cultivation on artificial media. Two of these nine cultures, one from a mesenteric gland of a 12-year old girl and one from a peritoneal tubercle of a 5-year old boy, exhibited a virulence for calves which entitle them to be classed as bovine tubercle bacilli.

Doubtless there are other well authenticated cases reported in the literature in which bacilli of the bovine type have been isolated from human tuberculosis but the cases collected above are sufficient for definite conclusions.

To summarize briefly; out of 306 cases in which the variety of bacillus present has been determined 63 or a little over 20 per cent were due to the bovine type of bacillus.

Investigated by	Total number cases investigated.	Number cases in which bovine bacilli were found.
British Commission	60	14
German Commission	138	22
Lewis	15	9
Duval	4	1
Ravenel	2	1
Fife and Ravenel	1	1
Theobald Smith	12	1
Lartigau	19	1
Vagades	28	1
Fibiger and Jensen	12	7
Westenhoeffer	1	1
Ebers	5	2
de Schweinitz, Dorset and Shroeder	9	2
	306	63

In considering the individual series of cases investigated by different men one is struck by the great relative difference in frequency with which different investigators found the bovine bacilli. For example Lewis in fifteen cases examined found bovine bacilli in nine cases, while on the other hand Vagades investigating 28 cases found the bovine type only once.

This difference is readily explained by the selection of the cases. Lewis' were all cases of cervical adenitis while Vagades obtained his cultures either from the sputum or the lungs at autopsy in all except one case.

CONCLUSIONS.

1. The clinical cases collected in the first part of this paper, in which the circumstantial evidence points more or less strongly to human beings having been infected with tuberculosis from bovine sources, cannot be presented as furnishing absolute proof of the question, but they point so strongly to tuberculous cattle as a source of danger to man that with such evidence alone before us it would seem advisable to take strict precautions against bovine tuberculosis.

2. The economic losses among the cattle themselves, aside from any possible danger to man, are sufficiently great to demand a vigorous effort to stamp out bovine tuberculosis.

3. The evidence furnished by autopsy statistics of primary intestinal tuberculosis, reported by different observers, is very conflicting, and even if there was agreement on a high incidence, this evidence could only be taken as circumstantial, since there is abundant opportunity for primary intestinal infection to occur with tuberculous material of human origin.

4. The use of tuberculins from human and from bovine bacilli has not yet thrown much light on the question. The agglutination reaction does not serve to differentiate the two types of bacilli.

5. It seems definitely established that there are two distinct types of tubercle bacilli; the human and the bovine type, which in a majority of cases investigated, have characteristics sufficiently fixed so that mutation from one type into the other does not occur.

6. The bovine type of bacillus has been demonstrated in 20 per cent of a series of 306 cases among human beings.

7. The bacillus which causes bovine tuberculosis may also cause tuberculosis in man. It must be borne in mind that every case of tuberculosis in man showing the bovine bacillus need not have received the infection directly from cattle for it is easily conceivable that a human having become infected from cattle may pass the infection on to other human beings.

8. The dangers from bovine tuberculosis to man are sufficiently great to warrant strict precautions against it.

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DR. ADAM THOMSON, THE ORIGINATOR OF THE AMERICAN METHOD OF INOCULATION FOR SMALL-POX.[1]

By HENRY LEE SMITH, M. D., Baltimore.

Dr. Adam Thomson was born and educated in Scotland. The exact date and place of his birth have not been ascertained, but, it is said, that he was on his way to Leith to claim his share of the family estate when he sickened and died in New York in the year 1767. In his memorable and eloquent Discourse on the Preparation of the Body for the Small-pox and the Manner for Receiving the Infection, he refers to

[1] An address read before the Johns Hopkins Hospital Historical Club, November 9, 1908.

"the famous Monro of Edinburgh" as one of his first masters in the healing art.

He settled in Prince George's County, in the Province of Maryland, early in the eighteenth century. In 1748 he went to Philadelphia where he continued the practice of his profession, his services being in demand throughout the colonies because of his eminence and success as an inoculator.

Dr. Thomson was one of the original members of the Philadelphia Assembly (1748); a founder of the St. Andrew's Society of Philadelphia in 1749, and vice-president of that body in 1751. He is credited with the leadership in the organization of the St. Andrew's Society of the State of New York, having been elected the first vice-president in 1756; and its president the succeeding year.

In 1738 he began his method of preparing the body for small-pox. It consisted of a two-weeks' course of treatment, or "cooling regimen" preparatory to inoculation, to wit: a light, non-stimulating diet, the administration of a combination of mercury and antimony, and moderate bleeding and purgation. He admitted that Boerhaave's[2] Aphorism No. 1392 advanced the "hint" that mercury and antimony properly prepared and administered "might act as an antidote for the variolous contagion." Dr. Thomson's phenomenal success with the method convinced him that "mercury under proper management is more of a specific agent against the effects of the variolous than the venereal poison." He was careful to give it within the bounds of salivation and to modify the regimen to suit the patient's age and constitution.

In his Discourse he says: "On every occasion, for the space of twelve years that I have been called upon to prepare people for the small-pox, either for receiving it in the natural way, or by inoculation (for I have prepared many for both), I have constantly us'd such a medicine as mention'd, and I can honestly declare that I never saw one so prepar'd in any considerable danger by the disease."

After the preparatory treatment, Dr. Thomson preferred his patients to receive the infection by inoculation rather than by exposing them to small-pox itself; his experience having shown that those inoculated escaped severe sore throat, and, usually, had a milder type of the disease than those allowed to contract it by direct contact. He inoculated on the leg, because he was of the opinion that the seat of local reaction should be at a point most distant from the brain and vital organs. To prevent or remedy a troublesome sore he advised "about 3 or 4 half drams of Jesuit's bark given at so many doses during the day."

His explanation of the manner in which immunity is acquired against small-pox is most interesting, and suggests to readers of to-day Pasteur's exhaustion hypothesis. He states: "It appears to me then highly probable, that there is a certain quantity of an infinitely subtile matter, which may be called the *variolous fuel,* equally, intimately and universely diffused through the blood of every human creature, in some more, in others less, that lies still and quiet in the body, never showing itself in any manner hitherto discovered, until put in action by the *variolous contagion,* at which time it is totally expelled by the course of the disease." He believed that mercury and antimony mitigated the malignant quality of the variolous fuel.

Dr. Thomson found the average medical practitioner of America poorly educated, and therefore a source of danger in the community. He recommends in the Discourse that the legislature interpose in behalf of the safety of the people and appoint proper persons to judge of the qualifications of those permitted to practice. To prevent harmful results from the use of his method in the hands of the uneducated, he says: "I have purposely avoided giving any formal directions about the preparation, thinking it sufficient to propose the general intentions to be pursued, which every judicious physician easily knows how to execute, and adapt to different constitutions; for I think none else ought to be entrusted with a matter of this sort. Nor do I mean by such, all those who by the courtesy of *America* are stil'd doctors, because it is well known that surgeons, apothecaries, chymists, and druggists or even mere smatterers in any of these, are all promiscuously call'd by that title, as well as real physicians."

Dr. Thomson delivered his Discourse on the Preparation of the Body for the Small-pox before the trustees and others in the Academy of Philadelphia, on Wednesday, November 21, 1750.[3] It was published the same year by Benjamin Franklin; reprinted in London in 1752, and in New York in 1757. It met with favorable reviews in America, England and France. Dr. George W. Norris, of Philadelphia, who had been unable to obtain the work, comments as follows: "It is spoken of as being written in a modest and plain style, the arguments made use of as highly plausible, and the author as actuated with a generous desire to communicate salutary advice in the management of a distemper which has proved fatal to multitudes." (The Early History of Medicine in Philadelphia, Geo. W. Norris, 1886, p. 106.)

Dr. Thacher (Amer. Med. Biography, 1828, Vol. I, p. 66) refers to the Discourse in the following manner: "This production was highly applauded both in America and Europe, as at that period (1750) the practice of inoculation was on the decline. The author states that inoculation was so unsuccessful at Philadelphia that many were disposed to abandon the practice; wherefore, upon the suggestion of the 1392'd Aphorism of Boerhaave, he (Thomson) was led to prepare his patients by a composition of antimony and mercury, which he had constantly employed for twelve years, with uninterrupted success."

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[2] Boerhaave's Aphorism, 1392: "Some success from antimony and mercury prompts us to seek for a specific for the small-pox in a combination of these two minerals, reduced by art, to an active, but not to an acrimonious or corrosive state."

[3] An original Franklin print of the Discourse, probably the only one extant, is on file in the library of the Surgeon-General's Office, Washington, D. C. Copies of it may be seen in the libraries of the Johns Hopkins Hospital, the Medical and Chirurgical Faculty of Maryland and of the College of Physicians, Philadelphia.

Drs. Redman and Kearsley of Philadelphia, and others, first opposed the method, but later it was universally adopted in the colonies and was favorably received abroad. In England it was used and recommended by Huxham, Andrew, Baker and others. de La Condamine, in France, recorded the success it had brought the English and American inoculators, and mentioned that the method was upheld by a New York physician in his Leyden thesis in 1764.[4] It soon became known as the American method of inoculation, and was employed with gratifying results, notably by Dr. Gale of Connecticut, Dr. Alexander Garden of Charleston, South Carolina, Dr. McKane of New Jersey, and by Dr. Alexander Hamilton of Maryland, who wrote ably in its defense. It was introduced as routine procedure in the first inoculating hospitals which were established near Boston, Mass., in February, 1764. Dr. William Barnett was called from Philadelphia to supervise the work because of his reputation there as a successful inoculator.

In describing the success of the method in the Transactions of the Philosophical Society for 1765, Dr. Gale makes this statement: "A. D. 1764. At this present writing, the small-pox is prevalent in the town of Boston; by the last accounts, 3000 had recovered from inoculation in the new method, by the use of mercury, and 5 only had died, viz., children under 5 years of age; so that it appears, that death without inoculation is 1 in 7 or 8: by inoculation without mercury, 1 in 80 or 100; *by inoculation with mercury, 1 in 800 or 1000.*" Dr. Gale in error, *ibid.*, styles Dr. Thomson "Dr. Thomas of Virginia," who, he says, began the "new method" with Dr. Murison of Long Island and several others in 1745. As a matter of fact, Dr. Thomson started his preparatory treatment seven years previously, in the Province of Maryland and carried on this pioneer work unaided by others.

In 1762 there appeared on November 25, in the Maryland Gazette, a long and scholarly letter written by Dr. Thomson, in which he laments the fact that his method of inoculation had been taken up by quacks, and reduced by them to "a matter of merchandise." He particularly condemns a certain Mr. Barnard of New Jersey, whom he styles "a man of little or no education in physic, or indeed in anything else," and also "the Jersey secret monger." It seems that Barnard had learned the details of Dr. Thomson's "cooling regimen" from a reputable physician, and had used it in 1000 cases with but two or three deaths, and these occurred "in very young children who were said to have died of other disorders." Barnard gave Dr. Thomson no credit for his success, but spoke of the drugs used as "specific remedies." He was known to have sold the secret of the "specific remedies" to other charlatans for a "piece of money." And further we read, that among a number of physicians in and about Philadelphia, who, from the first, had tried to bring Dr. Thomson's method into disrepute, was one, "Dr. J. R.," of New Jersey. This physician, Dr. Thomson tells us, after having openly ridiculed the method, as described in the Discourse, published some years later in one of the Philadelphia newspapers (ostensibly for the good of humanity) an account of the great success he had experienced in inoculating individuals, who had previously been put upon a course of mercury and antimony. He claimed with real cunning and with great injustice to Dr. Thomson that he found the source of inspiration for the *new method* in the writings of Boerhaave.

On the other hand, in the letter quoted, Dr. Thomson writes: "It gives me pleasure to do justice to the judgment and candour of Dr. McKane of New Brunswick in the Jerseys, on this occasion; for he inoculated a very considerable number, the same time with Mr. Barnard, but was so far from acting the mean and ungrateful part complained of, that he honestly owned all of his patients were prepared in the manner directed in my Discourse . . . . and he told me further, that he never gave his preparatory medicines in such a manner as to affect the salivary glands, and his success was very great, having never had a patient, so prepared, in the smallest danger." Again (*loc. cit.*) he thanks Dr. Alex. Garden, of Charleston, S. C., for his honesty in stating in public there that the uncommon success following the inoculation of a great number of individuals during a very fatal epidemic of small-pox in 1759, was entirely due to the employment of the method recommended in the Discourse.

In conclusion the writer wishes to emphasize the fact that Dr. Thomson's claim of the specificity of calomel in small-pox, "when used under proper management," *was strongly supported by the experience* of many impartial and trustworthy physicians. Moreover, we have seen that even quacks who employed the method somewhat at random, increased their reputation by the good results obtained from the use of mercury. Hence it would seem reasonable to assume that had inoculation not been superseded by vaccination, the American method of preparing the body for small-pox would have remained, with but slight modification, the most rational means of reducing the mortality during disastrous epidemics of the disease.

Dr. Thomson married the widow of James Warddrop, Esq., of Virginia. She was Lettice Lee, daughter of Philip Lee, of Virginia, and a great grand-daughter of Richard Lee, the emigrant. After Dr. Thomson's death, she married Col. Joseph Sim.[5] She had issue by Dr. Thomson only, Mary Lee Thomson, who married Col. Lilburn Williams, of Maryland, and Alice Corbin Thomson, who married Captain John Hawkins, a gallant officer of the 3d Virginia regiment of the Revolutionary Army.

[4] "Un médecin de la Nouvelle Yorck, en Amérique soutint à Leyde l'année dernière une thèse en faveur de cette methode," etc.

[5] From the Maryland Gazette, Thursday, April 11, 1776: "Prince George's County, Maryland, April the 7th, 1776. On Wednesday, the 3d inst., died Mrs. Sim, wife of Col. Joseph Sim, of this county, of a very painful and lingering illness which she supported with uncommon firmness and resolution. This lady possessed many virtues, accomplishments and valuable qualities in a very high degree. Her disconsolate husband and children and numerous relations and friends are left to lament their loss.

Dr. Adam Thomson died in New York City on September 18, 1767.[6] The following notice of his death appeared three days later in the New York Mercury:

"On Friday morning early, died here, Adam Thomson, Esq., a physician of distinguished abilities in his profession, well versed in polite literature, and of unblemished honor and integrity as a gentleman."

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NOTES ON NEW BOOKS.

Parasitology. A Supplement to the Journal of Hygiene. Edited by GEORGE H. F. NUTTALL, F. R. S., Quick Professor of Biology in the University of Cambridge, and A. E. SHIPLEY, F. R. S., University Lecturer in the Advanced Morphology of the Invertebrates. (*Cambridge: at the University Press.*)

This second number of the new journal is the first we have had for review. It is a well printed and admirably illustrated fasciculus of over 90 pages. Of the seven papers those most interesting to the medical profession are Castellani's, describing an amœbic abscess of the liver in a monkey and the causative amœba for which he proposes the name *Entamœba nuttalli.*

A very interesting article by Nuttall and Graham-Smith, on the mode of multiplication of several species of piroplasma in the circulating blood, and a paper by Nuttall, on the behavior of spirochætæ in *Acouthia lectularia* in which it is shown that the organisms may live several days in the gut at a low temperature, and that in one instance the parasites were transferred from an infected to a normal mouse by the bites of this parasite.

The journal is a credit to the editors and the Cambridge University Press.

Diseases of the Larynx. By HAROLD BARWELL, M. B., Lond., F. R. C. S. (*London: Henry Frowde, and Hodder & Stoughton, 1907.*) *Oxford Medical Publications.*

This small manual on diseases of the larynx covers the ground in a manner similar to that by Waggett on the nose. What we said in the review of the latter could be repeated for this.

The book is small, well printed, and will be acceptable to the student and practitioner of medicine who wishes to get a smattering of the subject. However, the author has no new ideas to present, and this volume simply adds another to this already greatly overburdened field.

Applied Surgical Anatomy. By GEORGE WOLSEY, M. D. Second edition. (*Lea & Febiger, 1908.*)

This book has long been recognized as one of the most useful of the large class to which it belongs. This edition is not merely a reprint of the first edition—the usefulness of which was proved by its exhaustion—but is a real enlargement and revision of the original issue, bringing the volume quite up to date. The recent work, for instance, on the parathyroid glands has been incorporated in the book. On the whole it is doubtful if a better work, in proportion to its size, exists on applied surgical anatomy.

Practical Anæsthetics. By H. EDMUND BOYLE, M. R. C. S., L. R. C. P., Assistant Anæsthetist to St. Bartholomew's Hospital, etc. (*London: Henry Frowde and Hodder & Stoughton, 1907.*) *Oxford Medical Publications.*

This is a very practical and concise work on anæsthetics. The author has purposely avoided the details of the physiology of anæsthesia in order to make the work as practical as possible. After a short but sufficient introductory chapter on the general conditions of anæsthesia, duties of the anæsthetist, examination of the patient, preparation of the patient, apparatus and instruments the anæsthetist should always have at hand, position of the patient, the moving of the patient while under anæsthesia, vomiting, shock and collapse, artificial respiration and after treatment, there follows a series of chapters on nitrous oxide, chloroform, ether, and ethyl-chloride with a brief and well-illustrated description of the methods of administering each.

Very little space is devoted to the open and the semi-open methods of administering ether. He rather discourages the use of these methods by taking the ground that they can be used only in children and are sometimes suitable for exhausted patients.

Chapter VI is devoted to mixtures and sequences. The remaining chapters treat of the selection of the anæsthetics for special cases and to the various positions of the patients while under an anæsthetic.

This book is very useful to both the student and busy practitioner who has not the time to devote to the study of such works as those by Hewett, Buxton, Turnbull, and Patton.

Glandular Enlargement and Other Diseases of the Lymphatic System. By ARTHUR EDMUNDS. (*London: 1908.*)

The author has brought together in a useful way the general knowledge of diseases of the lymphatic glands. He has attempted to make no additions to this knowledge. This presentation of the subject, while clear and interesting, is hardly complete and scientific. Hodgkin's disease, for instance, is dismissed with five scant pages; and very little account is taken of the recent work on the pathology of this disease. One is disappointed to find radical treatment of tuberculous glands of the neck advised by means of multiple transverse incisions; and one shudders to read that when tapping of a hydrocele (in children) fails "a good plan is to puncture the cyst with a fine trocar and cannula, allow fluid to escape, and then to inject 5 or 10 minims of pure carbolic acid."

Clinical Surgery. By DR. PH. BOCKENHEIMER. English Adaptation by C. F. MARSHALL, M. D., F. R. C. S. (*New York: Rebman Company.*)

This work consists of colored reproductions of models of pathological specimens, taken from von Bergmann's clinic. The models were made by Kolbow, in the Pathoplastic Institute, at Berlin. Bockenheimer has written a running commentary on the illustration; but the text forms really a trivial part of the book. Kolbow's models are little short of marvelous; and the four-color reproductions have been excellently done. The result is a series of illustrations—representing the more common pathological conditions met with in surgery—which reproduce the picture in the living subject with very great accuracy. Students are thus provided with a large amount of clinical material which, so far as inspection is concerned, can only be of very great value. Those who wish to familiarize themselves with the *appearance* of surgical-pathological conditions cannot do better (if actual patients are not at hand) than consult this book, the artistic work of which can hardly be too highly praised.

Physicians' Visiting List—1909. Price $1.00.

P. Blakiston's Son & Co. have just issued this annual work, now in its 58th year, and they are to be complimented in arranging so skilfully this most useful pocket note-book for the busy, country practitioner, who is constantly on the road. Other doctors also will find it serviceable. Its size and make-up are both pleasing. It contains various tables of signs, doses, simple rules about incompatability of drugs, poisoning, asphyxia, etc.

Sleeping Sickness Bureau. Bulletin No. 1. (*London: Royal Society, Burlington House, W. October, 1908.*)

The importance of "Sleeping Sickness" as an economical question in Africa is made evident by the publication of this new journal. The first number deals only with the "Chemo-Therapy of Trypanosomiasis" (unfortunately the writer's name is not given). The paper is a résumé of all that is known of this subject. There is no statement as to how often the Bulletin will appear. The editor is the director of the bureau, Dr. A. G. Bag-

shawe, and the publication is "issued under the direction of the Honorary Managing Committee." Its appearance is to be welcomed.

Diseases of the Eye. By Stephen Mayou, F. R. C. S., late Hunterian Professor, Assistant Surgeon and Pathologist, Central London Ophthalmic Hospital. With 119 original Illustrations and 8 color plates. Price $1.50 net. (*London: Henry Frowde, and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

A compact, thoroughly up-to-date manual on the diseases of the eye. It appears to be admirably adapted to the requirements of the undergraduate medical student and to afford all that is likely to be needed, as a handy reference book, by the family physician. It fits in very well with the two other special books in this Oxford series, which it has been my pleasure to read and commend, that is, Tod's Disease of the Ear, and Waggett's Diseases of the Nose. It is a pleasure to recommend these manuals to the student who desires to get at the essentials of each branch of special medicine and not to waste time over such parts of the subject as belong more particularly to the specialist. H. O. R.

Ophthalmic Surgery. By Josef Meller, Privatdocent and First Assistant K. K. 11, University Eye Clinic, Vienna. Illustrated. $3.00 net. (*Philadelphia: P. Blakiston's Son & Co., 1908.*)

Dr. Meller's book, as he states in the preface, was written in response to many requests from English-speaking physicians.

The author is so well known among American ophthalmologists as to require no introduction.

The book is profusely illustrated and the illustrations are so well executed as to be self-explanatory. The book is devoted exclusively to methods of operation employed in Fuchs' clinic. Many of these operations were originated by Dr. Meller; others were changed so as to conform to the ideas of the author and his fellow-laborers. While we fear American and English ophthalmologists are not given their full credit, nevertheless the value of the book is not materially impaired by this error of omission. The chapters on "Extirpation of the Lachrymal Sac" are excellent. The author fully describes this delicate operation and the illustrations seems to us to be as perfect as it is possible to have them.

Another "feature" of this work is the chapter on "Glaucoma." It is hard to conceive the subject treated being more carefully and thoroughly reviewed.

The book from the preface to the index is a work of great value and will find a welcome place in the library of the working ophthalmic surgeon. J. B., Jr.

Surgical Memoirs and Other Essays. By James G. Mumford, M. D., etc. Illustrated. (*New York: Moffat, Yard & Co., 1908.*)

Dr. Mumford is one of the few men in America seriously interested in the history of medicine, and his additions to it are to be valued, especially as furnishing sources of inspiration for others to pursue in more detail the lives of some doctors, whom he has sketched, or to write on other historical questions of medicine and surgery. The field is a large one, and has been but little cultivated. The author is at his best in the lives of Boston worthies about whom much is known, and knowledge still easy of access. Of them he writes with a sincere feeling of respect and admiration, and presents a vivid picture of their surroundings and activities. It is to be hoped that with his broad acquaintance of medical conditions in and around Boston during the past century, Dr. Mumford will give us more of his bright and entertaining essays. The volume is not even in quality; the first section, a "Narrative of Surgery," reprinted from Keen's System of Surgery, shows omissions, and its chapters are not well-balanced; but the longer memoirs are pleasant and agreeable reading. The last three papers might have been left out, as they are remote in subject from the historical studies. The portraits of the doctors written of are an attractive addition to this welcome volume.

Progressive Medicine, Vol. IV. December, 1908. Diseases of the Digestive Tract and Allied Organs, the Liver and Pancreas—Diseases of the Kidneys—Surgery of the Extremities, Tumors, Surgery of Joints, Shock, Anæsthesia and Infections—Genito-urinary Diseases—Practical Therapeutic Referendum. (*Philadelphia and New York: Lea & Febiger, 1908.*)

The contributors to this volume are all well known; four are Americans, Belfield, Bloodgood, Edsall and Lewis, and the fifth, John Rose Bradford, of England. The longest and only illustrated chapter is Bloodgood's, on the Surgery of the Extremities, etc.; this seems natural, as there is more advance made in surgery than in medicine; but the chapters are evenly proportioned, and they are all well prepared. As a "review of reviews," Progressive Medicine is a useful work for all busy practitioners.

Human Foods and Their Nutritive Value. By Harry Snyder, B. S., Professor of Agricultural Chemistry, University of Minnesota, etc. Price, $1.25. (*New York: The Macmillan Company, 1908.*)

This is a small work, adapted to the needs of the layman, as well as students who mean to be doctors, and of nurses; for them it is well written. The author describes the constitution of the simpler foods, also their comparative cost and nutritive values, and adds a few laboratory experiments of the simplest nature. It is practical and will doubtless find a ready sale among those who do not want an advanced work on this subject; it is only a primer.

Bier's Hyperemic Treatment in Surgery, Medicine and the Specialties. A Manual of its Practical Application. By Willy Meyer, M. D., Professor of Surgery at the New York Post-Graduate Medical School and Hospital, Attending Surgeon to the German Hospital, etc.; and Prof. Dr. Victor Schmieden, Assistant to Professor Bier, University of Berlin, Germany. Illustrated. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

In this little book, which is the first one on this subject published in the United States, hyperemic treatment is presented in a most attractive manner. In fact one is almost persuaded that no other treatment is necessary in the majority of surgical troubles, while even medical cases and those requiring the specialties are included, although to a lesser extent.

The principal points in technic are emphasized and the explanations are clear. The illustrations are excellent, the book is well-printed and the marginal notes are very satisfactory. On the whole it is thoroughly worth reading, and while some of the claims for this method of treatment are rather extravagant, nevertheless there is no doubt that the production of hyperemia, both by obstruction and by hot air, is a most valuable addition to our therapeutic resources. J. S. D.

A Text-Book of Surgical Anatomy. By William Francis Campbell, M. D., Professor Anatomy, Long Island College Hospital, etc. With 319 original illustrations. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

This book is divided into six parts as follows: Head and Neck, Thorax, Upper Extremity, Abdomen and Pelvis, Spine and Lower Extremity.

The illustrations are far above the average, many of them being constructed in a striking and unusual manner. They aid materially in interpreting the text.

Although descriptions are for the most part brief, they cover quite thoroughly the subject of surgery from an anatomical standpoint.

The book will be very useful in its field, and would be worth having for its plates alone. J. S. D.

Fiske Fund Prize Dissertation No. LI. Has Surgical Treatment Lessened the Mortality from Appendicitis? By FRANK P. VALE, M. D., Washington, D. C. (*Providence: Snow & Farnham Company, Printers, 1908.*)

Dr. Vale is to be congratulated on having secured this prize. He has analyzed and tabulated in statistical form nearly 56,000 cases of appendicitis, and comes to the conclusion that taking the operations all over the world the mortality is to-day between 7 and 8 per cent. To those interested in the study of the problem under discussion, this essay will prove invaluable.

An Analytical Index of Volumes I to X of The Medical Review and a Digest of the Facts Important to the Practitioner in the Medical Periodicals of the World. 1898-1907. Price, 7/6. (*London: The Medical Review, 66 Fensbury Pavement, E. C., 1908.*)

As this Index appears to be only of The Medical Review, the second half of the title is somewhat misleading. With the aid of the preface the method of indexing will be readily understood; and no doubt this volume will be of service to readers of The Review. Why "anterior tibial nerve" should be indexed under the first word is not evident, nor apparently in accord with the rules set forth. And there are other titles which would have been differently indexed by the reviewer. The task of indexing is a difficult one, and as much labor has been put into this work, and as it is on the whole clear, it deserves a grateful welcome.

International Clinics, Vol. III. Eighteenth Series. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

Thirteen of the twenty-seven contributors to this volume are foreigners; the rest are Americans, showing how evenly apportioned are the articles between the old and the new world. Treatment, Medicine, Surgery, Gynæcology, Pædiatrics, Orthopædics, Psychiatry, Neurology, Ophthalmology, Rhinology and Pathology all furnish their fair quota of papers. One of the best results of the Clinics is that it introduces the American doctor who does not read a foreign language to the best work that is being done in Europe, and almost all the writers present their subjects in a lucid and attractive style, so that the subscriber to the volume should be well satisfied with it.

An Alabama Student and Other Biographical Essays. By WILLIAM OSLER, M. D., F. R. S. (*London: Henry Frowde and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

In this book Dr. Osler has collected together thirteen of his historical and biographical essays delivered at various times from 1895 to 1906. A pleasing feature is the dedication to Dr. Welch, with the words of which everyone who knows him will cordially agree. The book contains thirteen chapters, each dealing with one who had something to do with medicine. For some, such as Keats and Locke, the medical life was overshadowed by other activities for which they are better known; yet it is well that we should be reminded that they belonged to the profession.

The essay, which gives the title to the book, is an account of the life of Dr. John Y. Bassett, of Huntsville, Alabama. Coming by chance across some of his articles, published about 1850, which suggested something unusual in the writer, Dr. Osler was prompted to find out more about him. We have the result in this essay. Dr. Bassett worked abroad in the thirties, especially in Paris, to which so many Americans went at that time, and there are many interesting extracts from his letters. He evidently felt the need of a view of a wider horizon than his home surroundings offered and went abroad some years after he had been established in practice. The sketch of Thomas Dover is especially interesting, as in addition to his work in medicine he was also a buccaneer, and on one of his expeditions rescued Alexander Selkirk (Robinson Crusoe) in 1710. Of the essays dealing with American men, there are five, namely, those on Oliver Wendell Holmes, Elisha Bartlett, Beaumont, William Pepper and Alfred Stillé, in addition to one on the influence of Louis on American medicine. There are also articles on Sir Thomas Browne and Fracastorius, the latter celebrated for his early description of syphilis. The last essay of the book deals with Harvey, being the Harveian oration at the College of Physicians in 1906, in which he has taken up especially the study of the growth of truth as exemplified by Harvey's discovery.

It is not possible to review all these essays in detail. They are of interest not only to physicians, but also to the general reader. It is significant how frequently this book has been reviewed in the daily papers and literary journals. To praise it is unnecessary, as we are all familiar with the character of Dr. Osler's literary work. Not the least of the thanks which many of us owe him, is gratitude for the stimulus which he has given to take an interest in the history of medicine.

Tuberculosis in the United States. Bureau of the Census, S. N. D. NORTH, Director. Department of Commerce and Labor.

This special pamphlet was prepared for the International Congress on Tuberculosis at Washington, D. C., this year. It will appear later in the Annual Report of the United States on Mortality Statistics of 1907, but its appearance at this moment was of real value, as showing to those who had come to Washington to study this disease in all its aspects the status of affairs in the United States. Like all the papers coming from the Census Bureau under Dr. North's direction, it has been admirably prepared, and is a report that will interest very many. It is furnished with numerous charts and diagrams.

Therapeutics: Its Principles and Practice. By HORATIO C. WOOD, M. D., LL. D., etc. Thoroughly revised and rewritten by HORATIO C. WOOD, JR., M. D., etc. 14th edition. (*Philadelphia and London: J. B. Lippincott Company.*)

The mere fact that this work on therapeutics has gone through fourteen editions since its original appearance in 1875 shows that it has been found useful by the medical profession.

The general utility of the book seems to rest chiefly upon three factors: (1) the consideration of the pharmacological action of the drugs; (2) the therapeutic value of the drugs and the mode of administration, and (3) the fairly extensive references to the literature which are to be found at the end of each chapter.

The attempt has been made to bring the work up to date. Among other things, a short section on opsonins has been added, the wisdom of which may be doubted by some. That bacterial vaccines are of value in certain infections is quite generally accepted; that the estimation of the opsonic index furnishes a reliable guide for the therapeutic use of vaccines is disputed.

Dr. Wood's volume is too extensively known to need detailed criticism. The press-work is well executed.

Gonorrhœa in Women. By PALMER FINDLEY, M. D. (*St. Louis, Mo.: C. V. Mosby Medical Book and Publishing Company, 1908.*)

This is a loosely written, discursive treatise of the subject of but slight value. The work of the proofreader is not good, and in the bibliography there are a shocking number of misprints; besides lacking in conformity as to titles, dates and subjects are both omitted, and in fact it could hardly be worse compiled. *Gonorrhoea* is thus written throughout the work; it should be *gonorrhœa*, if the final *o* is retained.

BOOKS RECEIVED.

Gynecology and Abdominal Surgery. Edited by Howard A. Kelly, M. D., F. R. C. S. (Hon. Edin.) and Charles P. Noble, M. D., S. D. Illustrated by Hermann Becker, Max Brödel and others. Volume Two. 1908. 4to. 862 pages. W. B. Saunders Company, Philadelphia and London.

Applied Surgical Anatomy. Regionally Prescnted. By George Woolsey, A. B., M. D. Second edition, enlarged and thoroughly revised. With 200 illustrations, including 59 plates, mostly colored. 1908. 8vo. 601 pages. Lea & Febiger, New York and Philadelphia.

Gonorrhœa in Women. By Palmer Findley, M. D. 1908. 4to. 112 pages. C. V. Mosby, St. Louis, Mo.

Atlas of Clinical Surgcry, with Special Reference to Diagnosis and Treatment. By Dr. Ph. Bockenheimer. English adaptation by C. F. Marshall, M. D., F. R. C. S. With 150 colored figures from models by F. Kolbow in the Pathoplastic Institute of Berlin. Three Volumes. 1908. 4to. Rebman Company, New York.

Diseases and Surgcry of the Genito-Urinary System. By Francis S. Watson, M. D., assisted by John H. Cunningham, Jr., M. D. Volume I. With 339 engravings and 23 colored plates. Volume II. With 115 engravings and 24 colored plates. 1908. 8vo. Lea & Febiger, Philadelphia and New York.

Diseases of the Skin and the Eruptive Fevers. By Jay Frank Schamberg, A. B., M. D. Fully illustrated. 1908. 8vo. 534 pages. W. B. Saunders Company, Philadelphia and London.

Therapeutics of the Circulation. Eight Lectures Delivered in the Spring of 1905 in the Physiological Laboratory of the University of London. By Lauder Brunton, Kt., M. D., D. Sc., LL. D. (Edin.), LL. D. (Aberd.), F. R. C. P., F. R. S. With 240 illustrations. 1908. 8vo. 280 pages. P. Blakiston's Son & Co., Philadelphia.

A Manual of Bacteriology, Clinical and Applied. By R. Tanner Hewlett, M. D., F. R. C. P., D. P. H. (Lond.). Third edition. 1908. 8vo. 638 pages. J. & A. Churchill, London. P. Blakiston's Son & Co., Philadelphia.

A Handbook of Suggestive Therapeutics, Applied Hypnotism, Psychic Science. By Henry S. Munro, M. D. Second edition. 1908. 8vo. 360 pages. C. V. Mosby, St. Louis, Mo.

Arteriosclerosis: Etiology, Pathology, Diagnosis, Prognosis, Prophylaxis and Treatment. By Louis M. Warfield, A. B., M. D. With an Introduction by W. S. Thayer, M. D. Eight original illustrations. 1908. 12mo. 172 pages. C. V. Mosby, St. Louis, Mo.

The Surgery of the Ear. By Samuel J. Kopetzky, M. D. Illustrated with sixty-three half-tones and line drawings, eight charts and four colored plates. 1908. 8vo. 368 pages. Rebman Company, New York.

On Infantilism from Chronic Intestinal Infection. Characterized by the Overgrowth and Persistence of Flora of the Nursling Period. By C. A. Herter, M. D. 1908. 12mo. 118 pages. The Macmillan Company, New York.

Action de la Contraction Utérine sur l'Oeuf Humain. Phénomènes de la Grossesse et du Travail. Par Dr. Paul Bouquet. 1908. 4to. 175 pages, 44 plates. G. Steinheil, Paris.

Proceedings of the American Medico-Psychological Association. At the sixty-third annual meeting held in Washington, D. C., May 7-10, 1907. 8vo. 356 pages. Published by American Medico-Psychological Association.

State Board of Health of the State of Michigan. Thirty-fifth Annual Report of the secretary for the fiscal year ending June 30, 1907. 8vo. 180 pages. 1908. Lansing, Michigan.

American Proctologic Society. Transactions of the Tenth Annual Meeting held at Chicago, Ill., June 1-2, 1908. 8vo. 146 pages.

A Dictionary of Medical Treatment. By Arthur Latham. 1908. 12mo. 325 pages. P. Blakiston's Son & Company, Philadelphia.

Ticks. A Monograph of the Ixodoidca. By George H. F. Nuttall, M. A., M. D., Ph. D., Sc. D., F. R. S., Cecil Warburton, M. A., F. Z. S., W. F. Cooper, B. A., F. Z. S., F. L. S., and L. E. Robinson, A. R. C. Sc. (Lond.). 1908. 4to. 104 + 35 pages. University Press, Cambridge.

Scientific Memoirs. New Series. No. 32. By Officers of the Medical and Sanitary Departments of the Government of India. *An Enquiry on Enteric Fever in India.* Carried out at the Central Research Institute, Kasauli, under the direction of Lieutenant Colonel D. Semple, M. D., and Captain E. D. W. Greig, M. D. 1908. Fol. 108 pages. Superintendent Government Printing, Calcutta.

Third Scientific Report on the Investigations of the Imperial Cancer Research Fund. Under the direction of the Royal College of Physicians of London and the Royal College of Surgeons of London. By E. F. Bashford. 1908. 4to. 484 pages. Taylor & Francis, London.

Transactions of the Maine Medical Association. 1908. Volume XVI. Part II. 8vo. Portland.

Human Foods and Their Nutritive Value. By Harry Snyder, B. S. 1908. 12mo. 362 pages. The Macmillan Company, New York.

Dr. Walter Bayley and His Works, 1529-1592. By D'Arcy Power, F. S. A. [Reprinted from Volume 90 of the "Medico-Chirurgical Transactions."] 1907. The Royal Medical and Chirurgical Society of London.

Surgical Memoirs and Other Essays. By James G. Mumford, M. D. Illustrated. 1908. 8vo. 358 pages. Moffat, Yard & Company, New York.

THE JOHNS HOPKINS HOSPITAL BULLETIN.

The Hospital Bulletin contains details of hospital and dispensary practice, abstracts of papers read, and other proceedings of the Medical Society of the Hospital, reports of lectures, and other matters of general interest in connection with the work of the Hospital. It is issued monthly.

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MULTIPLE HEREDITARY TELANGIECTASES CAUSING HEMORRHAGE (HEREDITARY HEMORRHAGIC TELANGIECTASIA).

By Frederic M. Hanes, M. D.,
Resident House Officer, Johns Hopkins Hospital.

The remarkable disease which forms the subject of this communication is either rare or has been seldom recognized. A description of the disease has appeared but once in American literature.

It is the purpose of this paper to describe eight typical instances of the affection occurring in two unrelated families; to review briefly all previously reported cases; to present a clinical picture of, and suggest a name for the disease.

Family XIV (Hanes, 1908).—*Recurring hemorrhages in four generations of one family; multiple telangiectases of skin and mucous membranes; no symptoms of hemophilia.*

Case I.—Mrs. Margaret R. is 53 years of age and has been subject to severe nose bleed for 43 years.

Family History.—Her mother, who died at 48 from heart disease, with dropsy and cough, suffered all her life with severe epistaxis. The patient says that she has frequently seen her mother faint following prolonged hemorrhage from the nose. She also states that upon the face, lips and within the mouth of her mother were numerous red spots similar to those upon her own face and lips. The patient had two brothers, both of whom were troubled all their lives with epistaxis and both exhibited the typical red spots upon face and lips. One of these brothers lived to be 53 years old, had a marked alcoholic history, and all the members of the family state that his face was greatly disfigured by the numerous red spots upon it. It is etiologically interesting that he always spoke of the spots as "whiskey bumps." The patient's father never suffered with nose bleed.

Personal History.—She has been subject to severe bleedings from the nose since childhood; scarcely a week has passed that her nose has not bled once or twice, often every day. Since her thirty-seventh year the epistaxis has increased in frequency and severity. It is not uncommon for her nose to bleed several hours at a time, all attempts to check the hemorrhage proving futile. The epistaxis is frequently spontaneous and the slightest injury to the nose is sufficient to provoke severe hemorrhage. Concomitant with the increase in severity of the epistaxis has been the growth of telangiectatic spots upon her face, lips and tongue. She does not bleed excessively from cuts, has never vomited blood, her gums do not bleed, nor has she ever noted blood in her urine or stools. She ceased to menstruate at 51. Previous to this she menstruated irregularly, often every two weeks. Within the past two years her condition has grown progressively worse. She has lost a great deal of blood and suffers constantly with headaches, breathlessness upon slight exertion and swelling of the ankl

Physical examination reveals a strikingly anæmic woman. She is so anæmic that the facial telangiectases, though numerous, are only to be seen upon close inspection. Scattered over her face are many small telangiectases ranging from a pin point to a green pea in size. They are especially numerous upon the ears and lips. Upon the edges and dorsum of the tongue, the hard palate and the gums of the lower jaw are numerous telangiectases. Scattered over the nasal mucous membrane are several bright red telangiectases. Upon the pads of the fingers and under the nails many small purple spots are visible. The conjunctiva of the right lower lid bears a bright red telangiectasis the size of a match head. The eye grounds are remarkably pale, but otherwise normal. Physical examination reveals nothing further of interest.

She has 1,500,000 red cells; 3000 white cells; and 15 per cent hæmoglobin. Her coagulation time is seven minutes.

Differential count as follows:

Polymorphonuclear neutrophiles	70.8%
Polymorphonuclear eosinophiles	2.5
Small mononuclears	17.4
Large mononuclears	5.6
Myelocytes	0.0
Normoblasts	0.0
Transitionals	3.6
Unclassified	1.6

There is slight poikilocytosis and anisocytosis.

Case II.—John F. R., aged 33, single.

The patient is a son of Mrs. Margaret R. (Case I).

Personal History.—He is not subject to recurring epistaxis. Since the age of 20 he has been greatly annoyed by severe hemorrhages from telangiectases which are numerous upon his lips and tongue. It is not uncommon for him to injure one of the labial or lingual telangiectases while eating, and thereupon blood actually spurts from the injured spot and further progress with the meal is rendered impossible. He has also been seriously hampered in his work as a fireman because of profuse hemorrhages from two telangiectases situated under the nail of the left middle finger. The history of their development is significant. Two years ago he ran a large splinter under the nail; suppuration ensued and the nail eventually came away. When a new nail finally grew two purple spots the size of rice grains were observed to have formed under it. Upon the slightest injury to the nail a surprisingly profuse hemorrhage results. He is compelled to wear a leather cot upon the finger constantly. He suffered from hemorrhoids for several years, finally having them removed by radical operation. The hemorrhages of which he complains are usually from the lips, tongue and left middle finger tip, occasionally from the nose, and always as a result of slight traumatism.

Physical Examination.—The patient is a robust, healthy man, without lesions other than those of the cutaneous capillaries about to be described.

Scattered over the patient's cheeks are several violaceous telangiectases ranging from a pin point to 3 mm. in size. Upon both lips, especially at the muco-cutaneous junction of the lower lip, are about twenty purple, slightly raised telangiectases. Scattered over the tip of the tongue are several cherry-red telangiectases, and two similar spots are present upon the upper gums. It is these telangiectases which bleed so profusely when injured. No telangiectases are to be seen upon the nasal mucous membrane. Under the nail of the left medial finger are two violaceous spots each about 2 mm. in diameter. There are several pin-point spots scattered over the tips of the fingers of both hands. The patient, however, bleeds only from the spots under the finger nail. He does not bleed freely from cuts nor do ecchymoses follow bruises. He has never to his knowledge had hematuria or melena. His joints are never swollen or painful. The quantitative estimation of his blood cells reveals no abnormality. The coagulation time is six and a half minutes (Boggs' instrument).

Case III.—Theodore R., aged 32, married.

The patient is a son of Mrs. Margaret R. (Case I).

Personal History.—He is a stone-cutter by trade, working entirely out of doors, and has a well-marked alcoholic history, "drinking when he has the money." All his life his nose has bled very easily, though never causing serious trouble. As long as he can remember he has had small red spots upon his lips and face and these have always bled profusely when injured. During the past three years the spots have increased greatly in size and number. Each year has added its crop of telangiectases until now his face is thickly studded with them. He does not bleed excessively from cuts nor are there any symptoms suggestive of hemophilia. He, like his brother, has suffered for several years from troublesome hemorrhoids; otherwise he is in the best of health.

Physical Examination.—The patient's face presents a truly remarkable picture. Scattered over the cheeks, ears, lips and tongue are more than one hundred telangiectases. These range in size from a pin point to a green pea and vary in color from cherry-red to dark purple. The smaller the spots the redder the color. The spots upon the tongue are scarlet red (Fig. I).

As one observes more closely, stretching the skin the while, the entire capillary bed work of the skin of the face is seen to be dilated so that the capillaries, normally invisible, are readily discernible. No telangiectases are to be seen within the nasal cavity, though here too the capillaries are distended. There are several violaceous spots upon the finger tips.

His red cells number 5,200,000; white cells, 7300; hæmoglobin, 100 per cent. Coagulation time, six minutes (Boggs' instrument). No poikilocytosis or anisocytosis of the erythrocytes. Except for the lesions described, the patient is physically robust.

Case IV.—Mary R., aged 18, single.

The patient is a daughter of Mrs. Margaret R. (Case I).

Personal History.—Among the earliest of her childhood recollections is the fact that her nose frequently bled. As the years have passed she has been more and more annoyed by epistaxis until now scarcely a day passes that her nose does not bleed several times. The hemorrhages are frequently spontaneous or the result of insignificant traumatisms. It is not uncommon for her to awaken at night and find pillow and night clothes wet with blood. She does not bleed from the lips or mouth. Cuts do not bleed unduly. Several teeth have been extracted with only normal consequent bleeding, and recently both tonsils were removed by a thorough dissection, the patient showing no abnormal tendency to hemorrhage. No melena or hematuria—in short, no symptoms whatsoever of hemophilia. The patient suffers almost daily with severe headaches and frequently feels weak and exhausted. Palpitation and breathlessness are experienced upon sudden exertion. The ankles and feet are often swollen. Menstruation is irregular and profuse, often every two weeks. Quite recently the patient was admitted to the Johns Hopkins Hospital, suffering with acute tonsillitis, endocarditis and mild acute articular rheumatism.

Physical Examination.—The patient is very pale. Here and there upon the face are small pin-point telangiectases. Upon the lower lip are several violaceous telangiectases ranging from a pin point to a pin head in size. Upon the dorsum of the tongue there is a brilliant red telangiectasis the size of a match head. The small vessels around the nasal orifice are greatly dilated. Upon dilating the left orifice with a speculum the nose began to bleed at once, apparently from injury to small dilated capillaries. Examination of the mucous membrane of the septum revealed numerous small telangiectases, some raised above the surface of the surrounding mucous membrane and of a darker color. Similar telangiectases were visible on the mucous membrane of the turbinates. There can be no doubt that these telangiectases are the

cause of the epistaxis. The patient has upon several occasions come to have the nose bleed checked and the hemorrhage was each time seen to come from one of these spots. Upon the pads of the fingers and under several of the nails are small bluish spots. None of these has ever bled. There are no telangiectases elsewhere upon the body. Except for a double mitral lesion, the patient is physically normal.

Blood examination as follows: erythrocytes, 3,236,000; leucocytes, 11,600; hæmoglobin, 68 per cent. Coagulation time, six minutes (Boggs' instrument).

Differential count:

Polymorphonuclear neutrophiles	84.0%
Polymorphonuclear eosinophiles	1.0
Small mononuclears	11.5
Large mononuclears	3.5

No myelocytes; no normoblasts, and no mastcells. No poikilocytosis; slight anisocytosis.

The treatment of this case has been most encouraging. All the visible telangiectases within the nose have been destroyed with chromic acid (followed by a neutralizing alkali) and the patient's general condition improved by fresh air, nutritious food, iron and arsenic. She is now earning her living and enjoying life.

Case V.—John R., aged 8.

He is the son of Theodore R. (Case III).

His case is of peculiar interest, for he has the rather equivocal distinction of being the youngest subject in whom the disease has been observed.

Personal History.—His mother states that he frequently bleeds from the nose. A slap on the face or a sudden jerking of the head suffices to produce epistaxis. Often the child awakens from sleep with the nose bleeding. Otherwise he has been a robust, healthy child.

Physical Examination.—Upon the lower lip at the mucocutaneous junction are two small red telangiectases, which I believe to represent the earliest appearance upon the face of these lesions so highly characteristic of the disease. Within the nasal mucous membrane numerous dilated capillaries are visible, though nowhere so grouped as to form telangiectases. No telangiectases are visible elsewhere upon the body.

Of the fourteen individuals comprising the last four generations of this family, nine have been subject to hemorrhages, while five have escaped. Males and females have been impartially affected.

I am much indebted to Dr. G. L. Taneyhill, Jr., for kindly referring to me this second series of cases.

Family XV (Hanes, 1908).

Epistaxis in four sisters; multiple telangiectases, affecting chiefly the mucous membranes; no symptoms of hemophilia.

Case I.—Miss Mary D., aged 46.

Family History.—The patient's father died at the age of 74 with pneumonia. He suffered from youth with recurring epistaxis and during the later years of life his nose bled every day. The patient states that he had numerous red spots upon his face and lips. Her mother was not subject to nose bleed. There were nine children in the family; three died in infancy, and one at the age of 27 during childbirth. This latter sister bled profusely and frequently from the nose. Five of the family are living, three females and two males.

Personal History.—Throughout the patient's childhood and youth she suffered extremely with severe epistaxis, which frequently necessitated plugging of the nostrils. Every day, often three or four times daily, the nose would bleed and as a result she became very weak, pale and incapacitated for any work. Sudden exertion, such as running up stairs, excitement or even bending down for any length of time caused nose bleed. About eighteen months ago, at a time when frequent hemorrhages had much reduced her strength, she developed an endocarditis, for which she was treated by Dr. G. L. Taneyhill, Jr. Since this attack the patient has been in fair health, though short of breath upon exertion and subject to palpitation and swelling of the ankles. The nose bleeds almost every day. With the exceptions noted, she has enjoyed good health. She does not bleed with abnormal freeness from cuts; has never had hematuria or melena to her knowledge. Injuries do not produce ecchymosis, and her joints have never been swollen or painful.

Physical Examination.—The patient is pallid and poorly nourished. Scattered over the face are numerous small dilated veins which here and there fuse to form purple telangiectases. These are most numerous under the eyes and at the bases of the alæ nasi. Upon the conjunctiva of the right lower and of the left upper lid there is a single small bright red telangiectasis. Upon both lips there are several quite typical telangiectases and the tip of the tongue is thickly beset with small cherry-red telangiectases. There are about a dozen similar spots upon the hard and soft palate. It is upon the nasal mucous membrane, however, that the telangiectases seem to have reached their maximum development. The resulting picture is truly remarkable, for at least a third of the nasal mucous membrane is the seat of bright red telangiectases. These are especially large and numerous on the anterior part of the nasal septum, though present to a lesser degree upon the mucous membrane of the turbinates and alæ nasi. They can be seen on the septum without the aid of a speculum. A crust of blood was seen surmounting one of the septal telangiectases upon one examination, and the patient said she had bled only a few hours before from that nostril. Under several of the nails there are small pinkish telangiectases, none of which have ever bled. She is elsewhere free from telangiectases and, with the exception of a well compensated mitral insufficiency, is apparently physically sound.

Blood examination: erythrocytes, 4,234,000; leucocytes, 5000; hæmoglobin 75 per cent. Differential count reveals no abnormality. Slight anisocytosis; no poikilocytosis.

Case II.—Miss Emma D., aged 26. The patient is a sister of Miss Mary D. (Case I).

Personal History.—Her nose has bled almost every day "as far back as she can remember." The bleeding is seldom very profuse and has never required surgical interference. Unusual exertion, excitement or a too-vigorous use of a handkerchief causes epistaxis. The epistaxis has been her only symptom and she has been quite free from any manifestations of hemophilia.

Physical Examination.—There are two quite definite telangiectases on the left cheek and ten or twelve scattered over the lips. Upon the tip of the tongue are numerous bright red telangiectases. The vessels of the fauces and pharynx are noticeably dilated, and projecting downward from the nasal pharynx is a blood-stained strand of mucus. The nasal mucous membrane presents much the same picture as that seen within the nose of Miss Mary D., except that the telangiectases are not so numerous or so large. Upon one examination recently blood crusts were present within the right nostril and a slight oozing could be seen from one of the septal telangiectases. The body is elsewhere free from telangiectases and the other organs apparently healthy.

Case III.—Miss Ida D., aged 28. Patient is a sister of Mary and Emma D.

Her personal history is but a repetition of that of Miss Emma D. Her nose bleeds two or three times weekly, but never very

severely, nor does she bleed from other parts of the body. She has never had any symptoms indicative of hemophilia.

Physical Examination.—There are no facial telangiectases, but upon the lips and tip of the tongue are several cherry-red telangiectases. The nasal mucous membrane is likewise affected, but very slightly; only a few small red telangiectases are to be seen and these upon the septum, anteriorly. There are no telangiectases upon other parts of the body and she is apparently in splendid health.

The two brothers, William, aged 34, and Edward, aged 38, are practically free from the disease. Both state that their noses bleed when they catch cold or injure the nose at all severely. Neither of them has telangiectases.

To Rendu, who in 1896 described the association of epistaxis with multiple telangiectases of the skin and mucous membranes, belongs the credit of having first recognized the syndrome as the manifestation of a distinct and separate disease. There exist, however, in the literature several incompletely reported cases which anyone familiar with the disease will, I believe, unhesitatingly accept as instances of multiple telangiectases causing hemorrhages. The interest which attaches to the growth of our knowledge of this peculiar malady justifies the review of these cases in some detail.

Family I (Babbington, 1865).—*Recurring epistaxis in five generations of same family; impartial transmission through males and females; no negative or positive mention made of the presence of telangiectases.*

"Mrs. L. was during all her whole life and up until the period of her marriage subject to frequent and violent epistaxis. She had four children, two of whom, a male and a female, likewise had habitual and severe epistaxis. The male died of the disease; the female had six female children of whom three suffered from epistaxis during all the whole period of their lives. One of these children, who is the patient, Mrs. K., has six children; two of them, females, have habitual and severe epistaxis. The elder has a son similarly affected. One of Mrs. K.'s sisters has two sons, both subject to violent recurring epistaxis. One of the sons is married and one of his children, a boy of six, has epistaxis. Mrs. K.'s other sister had a daughter, now dead, who suffered with violent epistaxis. Thus, epistaxis has occurred in five consecutive generations."

Family II (Legg, 1876).—*Family history of epistaxis in three generations; presence of developmental telangiectases upon face and trunk; no convincing personal history of hemophilia.*

A musician, aged 65, came complaining of nose bleed to which he had been subject since boyhood. There was no history of hematuria or rectal bleeding, but the patient had shown a tendency to bleed profusely from traumatic causes. His mother was said to have died from loss of blood and dropsy. Of his four brothers and three sisters only one, a girl, was subject to epistaxis. Of his own children, three of whom are living and three dead, a son 27 years of age and a daughter 22 years of age, suffer from epistaxis.

The patient presented numerous small nævi scattered over the face, forehead and various parts of the trunk. They were not congenital, but had developed about the 41st year of life. Since the age of 23 he had been subject to painful swellings of joints, recurring at regular intervals, affecting chiefly the great toe where the swelling first appeared, but also occasionally the great joints. No tophi. Violent fits of anger, as well as excessive beer drinking, lead to epistaxis. When seen he had been suffering from the bleeding every day for six weeks.

The two following reports are literal translations of Chiari's observations:

Family III (Chiari, 1887).

Case I.—*Recurring epistaxis in four generations of one family; multiple telangiectases upon skin, nasal and buccal mucous membranes; confusion with hemophilia.*

At the end of January, 1885, two sisters came to the clinic to be treated for frequently recurring nose bleed.

A. S., aged 40, and E. R., aged 36, stated that their grandmother and her brothers suffered from childhood with oft-repeated and severe nose bleed, but nevertheless had lived to ripe old ages, several up to 70 years of age. Their mother, who likewise from childhood bled from the nose, died at the age of 47 with dropsy, which developed apparently after a long period of nose bleed. The bleeding on the average became less frequent with advancing years. Two brothers and one sister suffered likewise from childhood with severe nose bleed. One sister, 38 years old, has so far recovered from the tendency to nose bleed that it occurs now only at the time of the menses and is then insignificant. Both first-named sisters have bled since childhood from both sides of the nose. As a rule, the bleeding extends through many weeks, whereupon some weeks without bleeding follow. One of them once bled for a long time from the gums.

Both of these sisters have upon their faces many flat, or only slightly raised, telangiectases, ranging in size from millet seeds to lentils, some of which have bled following slight traumatisms. There are similar cherry-red spots sparsely scattered over the upper part of the trunk. Upon the nasal septum and upon both under and middle turbinates, extending far back, one sees numerous sharply bordered, slightly raised spots of intense cherry-red color, varying from a millet seed to a lentil in size. They bleed upon slight injury. Upon the tongue and mucous membranes of the lips are similar spots which look like telangiectases. The mucous membranes are pale. One of the sisters has four children of whom only the youngest, four years old, bleeds from the nose. The other sister has one six-year-old boy who has suffered four years from nose bleed. Both sisters state that they never bleed very freely from cuts.

"It is obvious," the author remarks, "that in both of these patients we have to do with a slight grade of hemophilia, which manifests itself principally through the occurrence of nose bleeding from many cherry-red extravasations. In addition, there are many long-existing telangiectases which always retain their cherry-red color. I could not observe through several weeks study actual changes in the first-mentioned cherry-red spots, as is the rule with blood extravasations. One could think perhaps of multiple telangiectases of the mucous membrane which are hereditary in a family, and really this was my first view of the matter. However, a succession of observations upon a second bleeder family (Case II) permitted me to see the matter in another light."

Family IV.

Case II.—*Severe recurring epistaxis in three generations of one family; multiple telangiectases upon the skin and mucous membranes.*

"Prof. Nothnagel sent me a patient named Goldschmidt, who had suffered since childhood from epistaxis which had often assumed a very dangerous character. Her father had the same trouble. The patient, about 30 years old, was very anæmic and complained that frequently small red spots came upon her hands, tongue and lips. Upon examination there were seen upon the right cheek several cherry-red spots the size of lentils, which disappeared upon pressure, but soon returned. Similar spots and small nodules are present upon the tongue and lips. The pharyngeal and tracheal mucous membranes are pale. In the nose one sees upon both sides of the septum and the lower and middle

turbinates, extending far back, large numbers of round and stellate, cherry-red, flat or somewhat raised spots.

"The patient's sister, Mrs. Wasmuth, has likewise suffered from childhood with severe nose bleed, but never so severely as Mrs. Goldschmidt. She is also much stronger. Upon her tongue and within the nose the same sort of spots are seen as described above, but smaller and less numerous. Some weeks before the patient was seen there had formed on her under lip a pea-sized bluish red infiltrate, and upon the nose and on both cheeks several small red spots had appeared. Such spots and infiltrates had often appeared formerly, but had always disappeared after some weeks. She stated that her paternal aunt suffered with severe nose bleed and many large red spots were present upon her forehead. Mrs. Wasmuth had three children, one of whom died some years ago from severe nose bleed. Her 12-year-old son, whom I likewise saw, suffered with nose bleed and showed upon the left septum dark red spots the size of lentils, which I destroyed with the loss of much blood by the galvano cautery. Upon the nasal septum of her 10-year-old daughter, who bled much less from the nose, I saw a long venous blood vessel and destroyed it. The hemorrhages ceased after this. In the case of the boy, however, the same methods yielded no improvement.

"I am constrained, therefore, to designate the spots upon the sisters, S. and R. (Case I) blood extravasations which, however, changed only slightly; a thing that is not uncommon in hemophilia."

These cases are unquestionably classical examples of telangiectatic hemorrhage. The diagnosis of hemophilia is obviously incorrect.

Chauffard in 1896 reported the following case, in which there is no family history of hemorrhages:

Recurring hemorrhages from telangiectases of the skin and mucous membranes; history of former hemophilic symptoms.

"The patient whom I have the honor to present to the society appears to me afflicted with a disease differing in many ways from that curious affection so rare in France, namely, hemophilia. Her history deserves a detailed report.

"Madam C. is aged 50 and has never suffered from any other pathological conditions other than those of hemorrhagic origin which we are about to study. Not only is her personal history negative, but one cannot find any hemorrhagic taint or appreciable nervousness in her family. Her father died of hemiplegia. Her mother, four brothers and one sister met accidental deaths. There is no trace of hemophilia in collateral branches of the family.

Personal History.—"The patient has menstruated from the age of 15 regularly, freely and without menorrhagia. Her marital history is negative; no children. The menopause occurred uneventfully at the age of 47. At the age of 20, while stooping one day, the patient felt something warm run down her forehead which proved to be blood produced by a hemorrhage at the edge of the scalp in the median region a little above the forehead. The bleeding ceased spontaneously at the end of half an hour. A similar bleeding from the edge of the scalp occurred twelve years later, which was so severe as to require the attentions of a physician. About one year after the first hemorrhage from the border of the scalp, a palatine hemorrhage occured which lasted about seven hours. On the inferior surface of the second left toe is a little violet point about the size of a millet seed. Bleeding from this point, either spontaneous or from the slight trauma incident to walking, is frequent and often abundant enough to soak the foot and stocking. Hemorrhages occur now and then from the middle finger of the left hand and from the right thumb. The blood comes from the groove beside the nails and one can see at these points little ecchymoses. I have demonstrated for myself these digital hemorrhages. Besides the two hemorrhages from the border of the scalp the patient has bled from the right eyebrow, where one notes a little red point at the junction of the outer and middle thirds. At another time the patient bled freely from the left ear.

"Epistaxis is very frequent, lasting from four to five hours, sometimes from one nostril, sometimes from both. Upon five occasions it has been necessary to pack the nasal fossæ. She has frequently bled from the palate. The last of these hemorrhages, which I was able to follow, lasted about eight hours and weakened the patient very much. She bleeds occasionally from the tip of the tongue, and at the time of one such hemorrhage the patient noted small subconjunctival ecchymoses in the left eye, which, however, never bled. There has been no hematuria or melena.

"All of these cutaneous and mucous hemorrhages were spontaneous. Divers traumatic hemorrhages have occurred. Ten years ago, following the extraction of a lower molar tooth—the only tooth ever extracted—a grave hemorrhage occurred. At this time the slightest pin prick bled freely and a blow, however light, made an ecchymosis. In order to avoid troublesome bleeding from the gums the patient was compelled to renounce brushing her teeth; she had to content herself with softly cleaning them with a fine thread.

Physical Examination.—"The patient is a small woman and her subnormal stature is explained by a very pronounced right scoliosis which began about the age of 15 and has steadily progressed. Beyond a definite degree of arterio-sclerosis, no other abnormalities are made out. The urine is negative. The patient is pale and tired-looking with a slightly earthy tinge to the complexion. In the depth of the anæmic skin many red lines are to be seen disseminated over both cheeks, brow and auricles of the ears. The patient was ignorant of these little sanguineous blotches and could not say even approximately when they began. The objective characters of these different spots are identical. For example, with a lens one sees that each red spot is formed by one or more little dilated venules arborescent or plexiform, forming little nævi in miniature. Each of these capillary telangiectases seems very superficial and the contained blood is brilliant red, approaching the arterial aspect always present in the spontaneous hemorrhages of the patient. These varicosities are most numerous on the right cheek and left ear. They are very numerous at the muco-cutaneous junction of the lower lip. On the buccal mucous membrane numerous similar telangiectases are present. Many bright red punctate arborescences are visible on the palatine vault, especially upon the hard palate. It was at the location of the principal one of these spots that I recently saw a continuous hemorrhage which lasted eight days. At the tip of the tongue there are a dozen punctate points as large as the head of a pin. There are several similar spots on the sublingual mucosa. The blood examination revealed the following: Red blood cells, 3,689,000; white blood cells, 14,819; hæmoglobin, 65 per cent. No poikilocytosis or anisocytosis.

"Under the microscope a reticulum of fibrin was seen to form in from ten to fourteen minutes."

Chauffard rather dubiously accepts this case as one of hemophilia, noting, however, the absence of arthropathies, hematuria and melena. As a compromise he suggests the rather fanciful name of "cutaneous hemophilia." He is at some pains to prove that the condition is not one of hysteria, a labor which I think most readers will find supererogatory. He concludes that the telangiectases are merely stigmata of an atypical form of hemophilia, recognizing, however, that the hemorrhages always took place from the telangiectases. Whether or not those symptoms of hemophilia, said by the patient to have

been present at one period of her life, were in evidence while the patient was under observation, does not appear.

With the publication of the following excellent description by Rendu in 1896, the stigma of hemophilia, or worse still, of hemorrhagie diathasis, was removed from the disease and the path eleared for subsequent scientific observation.

Family V (Rendu, 1896).

Severe recurring epistaxis; family history of nose bleed; no symptoms of hemophilia; marked anæmia.

"I have observed in my service a disease which in certain features resembles a case of hemophilia reported by M. Chauffard. The patient's name is S., aged 52 years. He is a large, well-developed man, but pale and tired-looking. The skin is slightly yellow, almost icteric in hue. He seems very weak and the least exertion causes palpitation. When he bends and rises quickly he experiences a feeling of vertigo. His appetite is good and he has no fever. The appearance of anæmia and debility is due to a double series of symptoms. For two months he has been subject to an intermittent diarrhœa which has greatly exhausted him, but which has never shown the character of a dysentery.

"The abdomen is negative. The predominating symptom at present is a daily recurring epistaxis. During the past three weeks his nose has bled once, often several times, daily. The hemorrhages usually begin in the early hours of the morning and he has frequently been awakened by the apparently unprovoked epistaxis. His nose rarely bleeds during the day and only exceptionally while out of doors. The hemorrhages are, as a rule, not very profuse, though frequently amounting to 200 or 300 cc. It is this constant loss of blood which has produced the anæmia, prostration, yellow tinge to the skin, palpitation and vertigo. Physical examination does not reveal any constitutional cause for the epistaxis. The heart, arteries and kidneys are normal. In brief, we are confronted with an epistaxis of hidden causation, an essential epistaxis.

"Upon searching into the personal antecedents of the patient facts are adduced which, if they do not point to a true hemophilia, yet indicate the presence of a hemorrhagic tendency. His father died of dysentery with repeated crises of melena at the age of 55. His mother was subject to recurring epistaxis. One brother also suffered from abundant and repeated epistaxis. He himself began to bleed from the nose at the age of 12, and during his youth he suffered constantly, though in an intermittent fashion, therefrom. This disposition has become notably aggravated with advance in years and since the age of 35 the hemorrhages have been very marked. The bleeding is always from the nose. He has never had hematuria or purpuric spots on the body. His gums do not bleed nor does he bleed abnormally from cuts. Two teeth have been extracted without any notable consecutive hemorrhage. This is not, then, a condition of true hemophilia, notwithstanding the frequent repeated epistaxis. One particular which resembles exactly the observation of M. Chauffard explains perhaps the singular localization of the hemorrhages and their frequent recurrence. There are upon the skin of the nose, the cheek, the upper lip and the chin small purple spots ranging in size from a pin head to a lentil. They are true cutaneous angiomata produced by dilatation of the superficial vessels of the skin. They pale on pressure, but do not disappear. Some angiomata of the same nature are scattered over the neck and chest. They do not exist on the arms or legs. This distribution is not limited to the skin. They extend also to the mucosa. There are small vascular dilatations, true telangiectases, on the inner surface of the lips, cheeks, upon the tongue and on the soft palate, with the identical characters of those on the skin, but having a more vivid coloring due to the thinness of the epithelium. On the nares we do not find these punctiform angiomata, but it is not unreasonable to suppose that in the nasal cavity and nasal fossæ the same exist. One could thus understand why it is always the nasal mucosa that is the seat of these hemorrhages so frequent and so abundant. What seems to prove that a local anatomical lesion explains this pseudo-hemophilia is the fact that general medication, astringents and tonics, in no wise affect the occurrence of the hemorrhages. During the first three days I confined myself to the general treatment of the patient, but the epistaxis continued unabated. It stopped, on the contrary, in short enough time, on employing an application directly to the mucosa. After the first day the loss of blood was insignificant and the epistaxis which occurred on the following night was infinitely less severe than that of preceding nights; after the third day the hemorrhage never reappeared. This result was accomplished by having the patient use several times a day the following application upon the nasal mucous membrane: antipyrin, 5 gm.; tannin, 1 gm.; powdered sugar, 10 gm."

Admitting the excellency of Rendu's observations, it is, however, to a paper by Osler, published in 1901, that our growing knowledge of reeurring hemorrhage of telangiectatie origin is due. A glance at the appended bibliography will render obvious the striking impetus imparted to the study of the disease by Osler's eommunieation.

Family VI (Osler, 1901).

Case I.—*Attacks of epistaxis from boyhood; seven members of the family subject to it; telangiectases on skin of face and mucous membranes of nose and mouth.*

George B., aged 57; occupation, sailor.

Family History.—The patient's father died at the age of 69 from stone in the bladder. The son says his father was all his life subject to bleeding from the nose. The hemorrhages were frequent, generally every day No other members of his father's family, so far as he knows, suffered from epistaxis, and his mother was likewise free from it. Of the patient's three brothers, one bleeds from the nose and has numerous red spots upon his face (see Case II). He had two children, both of whom were in childhood subject to recurring nose bleed. In the third generation the patient has one child, aged 13, who bleeds occasionally from the nose. In the fourth generation a girl, granddaughter of the patient's sister, has had epistaxis frequently.

Personal History.—The patient has been a sailor for 43 years; is a moderate drinker; had syphilis 30 years ago. The epistaxis began about his tenth year and was of almost daily occurrence, though never very severe. About the age of 37 the epistaxis increased in frequency and severity and for three years he was unable to work because of the prostration produced by the bleeding. He has on two occasions bled profusely from spots upon the face. He has frequently been anæmic, with swelling of the feet and shortness of breath. He was recently operated upon for hemorrhoids of thirty years duration. There is no history suggesting hemophilia.

Physical Examination.—The patient was a large-framed man; he was short of breath; face swollen and anæmic. He had bled from the nose up to the time of admission and there was a clot of blood projecting from the left nostril. "The face presented a very unusual appearance, owing to the large number of dilated venules and capillary and venous telangiectases." The telangiectases were most numerous on the ears, cheeks and lips near the muco-cutaneous junction. They were very numerous upon the nasal mucous membrane, especially upon the cartilaginous portion of the septum. Except for a number of telangiectases upon the tip and along the edges of the tongue, the mucous membrane of the mouth appeared normal. The legs were swollen to the middle of the calves. Urine negative. Blood: erythrocytes,

2,908,000; leucocytes, 8000; hæmoglobin 15 to 20 per cent. Coagulation time, with Wright's tubes, 5½ to 7 minutes.

Case II.—*Epistaxis from childhood; telangiectases of skin and mucous membranes; bleeding from some of the spots; cancer of the stomach; death; autopsy.*

William B., aged 55, sailor. The patient's family history was given in Case I.

Personal History.—Patient began to bleed from the nose very early in life and this has ever since been a source of constant annoyance, on several occasions causing extreme anæmia and weakness. The spots on his face and lips have bled occasionally following injury, but the nose bleeds without apparent provocation. Of late years bleeding has become less frequent. He has led the irregular life of a sailor and has been at times a very heavy drinker.

Physical Examination.—The patient was pale and sallow. Scattered over the face were a number of telangiectases, most numerous on lips, cheeks and ears. They were also present upon the tongue and upon the mucous membrane of the nasal septum. The patient had a large tumor mass in the abdomen, evidently a new growth of the stomach. The blood examination showed: erythrocytes, 4,488,000; leucocytes, 7400; hæmoglobin, 71 per cent; coagulation time 9 to 11 minutes, reduced to 4 minutes by calcium chloride. The patient died in the hospital and the following anatomical diagnosis was made at autopsy: "Cancer of the stomach, mesentery and omentum, liver, retroperitoneal glands, lungs and brain. Angiomata of the mucous membrane of the nose and of the stomach. In the stomach there were a dozen round foci, each 3 mm. to 4 mm. in size, which at first looked like ecchymoses, but were dilated venules and capillaries." Sections of the septum of the nose showed large dilated veins just beneath epithelium.

Case III.—*Recurrent epistaxis from tenth year; multiple telangiectases of the skin and mucous membranes of nose and mouth.*

M. W. C., aged 49. Admitted to the Johns Hopkins Hospital, complaining of epistaxis, which had recurred at short intervals from his boyhood.

Family History.—So far as patient knows he is the only member of his family who has ever suffered with recurring nose bleed.

Personal History.—When ten years old he began to have frequent attacks of epistaxis of such severity as to render him weak and anæmic. The bleeding would begin without provocation as a slight oozing and end in a very free hemorrhage. For thirty-nine years, except for brief periods of improvement, he has constantly suffered from frequent epistaxis. He has been an active business man and the bleeding with the constant weakness has greatly interfered with his work. The hemorrhages have often been so profuse as to necessitate the plugging of the nostrils. When a lad he noticed red spots upon his face and hands; they have grown more numerous with advancing years, especially within the past seven or eight years. He has bled perhaps twenty-five times from the spots on his hands.

Physical Examination.—Patient was a well-nourished, but anæmic-looking, man. The blood picture showed: erythrocytes, 3,460,000; hæmoglobin, 38 per cent; marked poikilocytosis. A differential count was as follows: polymorphonuclears, 80 per cent; small mononuclears, 10 per cent; transitionals, 9 per cent; eosinophiles, 1 per cent. Coagulation time, with Wright's tubes, 2½ minutes.

"The telangiectases were most numerous on the face, which was much disfigured by them (see Fig. 3). On the right cheek there were twenty-five, some of which projected slightly beyond the skin as purplish spots from 1 mm. to 4 mm. in diameter; the largest presented a stellate arrangement of veins. On the left cheek there were about twenty, several with quite large veins passing to the center. While most of them were quite superficial, there were others subcutaneous and bluish in tint. On the lower lip the edge at the skin was closely set with them, and on the mucous membrane of the left side there was an angioma the size of a split pea. On the upper lip there were many small ones, and in the very center, just at the raphe, there was a large, deeply-seated, blue one. Scattered over the forehead were eight or ten, most of them purplish red, one or two near the margin of the scalp, deep-seated and blue. Here and there on the scalp a few could be seen. On the upper surface of the tongue there were five or six, and several on the under surface, all of them small and very bright red in color. There were none on the pharynx, but there were a number on the inner surfaces of the cheeks and on the gums, which were not swollen. The skin of the ears presented numerous pin-point telangiectases, giving to it a very peculiar appearance; the spots were about the size of the central point of a flea bite.

"Scattered over the back, chest and abdomen were two or three dozen bright red angiomata, none of them more than 2 mm. or 3 mm. in diameter. Several of them project, and one or two are almost pedunculated. The arms and legs are practically free. On the hands, however, there a good many angiomata, nearly all small and pin point. They are scattered over the fingers and palms, particularly about the pads of the fingers.

"Dr. Warfield made several careful examinations of the nose, and reported that on both sides of the septum there were numerous scattered angiomata, very similar in appearance to the smaller ones on the cheeks, and tortuous veins could be seen radiating from their centers. With the exception of these spots the mucous membrane of the nose and throat looked normal."

Family VII (Osler, 1907).

Case IV.—*Hemorrhages from nose and mouth since tenth year. Multiple telangiectases upon the skin of the face, ears and lips.*

The patient is a physician, aged 53.

Family History.—The patient's grandfather, father and one sister had red spots upon their faces, and his son, 20 years of age, began to have frequent attacks of epistaxis at the age of 16, which have never been very profuse, but are quite annoying. He has no spots upon his face.

Personal History.—The patient had from his tenth year bled with great profuseness from his nose and from red spots upon his face. Occasionally hemorrhages had taken place from spots upon his head and arm and frequently from the mucous membrane of the mouth. The hemorrhages have grown more severe with advanced age and "within the past year bleeding has been very profuse, scarcely a day passing without loss of blood." The frequent bleeding has been a source of constant distress to him and, though himself a physician of large experience, the malady had not yielded to his own efforts, nor to those of many specialists whom he had consulted. He regarded the condition as one of hemophilia.

Physical Examination.—There were numerous telangiectases upon the skin of the face, ears and lips. No mention is made of an examination of the mucous membranes of the nose and mouth, but the presence of telangiectases may be inferred in the absence of a negative report and in view of the fact that "though usually bleeding from the nose, he had bled from the spots on the skin of the face and on the head, once badly from a spot on the arm and very frequently from the mucous membranes of the mouth."

This case has been published by Coe as an instance of hemophilia and exhibited as a striking example of the efficacy of calcium lactate in the treatment of this disease. Coe's examination of the blood revealed; erythrocytes, 3,680,000; leucocytes, 5000; hæmoglobin 70 per cent. Slight poikilocytosis. No abnormality noted in a differential leucocyte count.

Dr. Brown Kelly's paper, in which he reports the two following cases, is a splendid addition to the subject, and its value

is greatly enhanced by the two colored plates which accompany it, and which are herewith reproduced by the author's kind permission. (Figs. 4 and 5.)

Family VIII (A. Brown Kelly, 1906).

Case I.—*Severe recurring epistaxis; multiple telangiectases of skin and mucous membranes; death at 48 from syncope induced by a prolonged epistaxis.*

A woman, aged 41, came in May, 1898, complaining of severe recurring epistaxis.

Family History.—She knew nothing of her grandparents. Her father died at the age of 62 in consequence of frequent bleedings from the nose. There were numerous red spots upon his face similar to those occurring upon the face of the patient. The patient has four uncles and one aunt, all of whom are exempt from the condition described. The patient's mother never suffered from epistaxis. A sister of the patient bleeds repeatedly from the nose and exhibits numerous red spots upon her face.

The patient has a daughter, aged 23, and a son, aged 20. The former bleeds from the nose and has red spots upon her face; the latter is not subject to epistaxis and has no spots upon his face.

Personal History.—At the age of 12 she began to bleed repeatedly and profusely from her nose and, with occasional periods of improvement, this persisted until her death, while under observation, at the age of 48. Death came suddenly from syncope induced by severe and persistent epistaxis. Reddish spots began to appear upon the skin of her face about her twenty-ninth year. The cheeks, ears, lips and finger tips were especially affected. After her thirty-eighth year the spots increased greatly in number and size, and the epistaxis at the same time became alarming. The onset of winter always caused marked exacerbation of the epistaxis, and this necessitated her staying in the house from October until March of each year. The weakness induced by the severe epistaxis frequently confined her to bed for several months at a time. The nose bleed was sometimes spontaneous, sometimes the result of slight trauma; hemorrhages from the cutaneous telangiectases were always traumatic in origin. There were no symptoms indicative of hemophilia.

Physical Examination.—The patient was a stout, well-developed woman. The face was sallow and presented numerous telangiectases, varying in size from a pin point to 3 mm. They were grouped especially over the cheek bones and upon the lobes of the ears. Scattered over the nasal mucous membrane were numerous telangiectases, especially well seen upon the middle and inferior turbinates in the septum, anteriorly. "Bright red dots, short lines and spider-like formations were present." There were three or four small red spots upon the dorsum of the tongue. The patient's condition grew progressively worse, until syncope, following prolonged epistaxis, terminated the scene in 1905, seven years after her first visit to Dr. Kelly.

Case II.—*Frequent hemorrhages from lips, mouth and nose; multiple telangiectases upon skin of face and hands and mucous membranes of nose and mouth; blood picture of simple anæmia.*

The patient, aged 40, is a sister of Mrs. M., reported in Case I.

Personal History.—About the age of 17 the patient began to have hemorrhages from lips and tongue, occasioned apparently by the injury of small red spots present upon the lips and lingual mucous membrane. Since the age of 17 these red spots have increased progressively in size and number, and since the age of 27 similar spots appeared upon her cheeks and fingers. She is subject to occasional epistaxis, although the hemorrhages from her lips and tongue are more profuse and constitute her major complaint. The hemorrhages are frequently spontaneous, occurring when the patient is sitting quietly, or during the night when asleep. There is no periodicity in the occurrence of the hemorrhages; they may occur daily for a week and be absent throughout the following week. From October to March they are especially profuse and frequent, occurring almost every day. In summer the longest interval between bleedings is about a fortnight. There is no evidence of hemophilia.

Physical Examination.—Many telangiectases, varying in size from a pin point to a hemispherical elevation about 3 mm. in diameter, are present upon the face, lips, tongue and hard palate. They are scattered profusely over the nasal mucous membrane. Several are present upon the palms, the palmar aspect of the finger tips, and beneath the finger nails; one or two in exposed situations on the fingers often bleed. A few have lately developed on the scalp and occasionally give rise to bleeding when the hair is combed.

Examination of the blood reveals the following picture: erythrocytes, 3,500,000; leucocytes, 6150; hæmoglobin, 90 per cent. Differential count as follows: polymorphonuclears, 68.3 per cent; small mononuclears, 26 per cent; large mononuclears, 5 per cent; eosinophiles, .7 per cent. Poikilocytosis slight; no normoblasts.

In addition to the above two cases belonging to one family, Brown Kelly in 1908 reported the following instance, apparently non-hereditary:

Case III.—*Multiple telangiectases limited to right side of head; severe epistaxis; large angioma of right cheek.*

Family History.—The patient, a woman, aged 35, is the eldest of the family. Her father, mother, two brothers, three sisters, as well as all other relatives, so far as she knows, are free from telangiectases and have no tendency to epistaxis or to bleed from cuts.

Personal History.—The patient has been subject to epistaxis from girlhood, but this became alarmingly severe only two and a half years ago. The telangiectasis, which first appeared was on the lower eyelid, she cannot say exactly when, only that it was "many years ago." Subsequently other telangiectases appeared on the cheek, nose and sclerotics.

Physical Examination.—"The telangiectases are confined to the right side of the face, the right nasal fossa, right half of palate and uvula and right faucial pillars. There are none elsewhere."

Dr. Kelly says in a recent letter: "From the brief description of this case you will see that it differs greatly from my other two, which conform to the ordinary type. Prof. Osler has examined the patient and regards the telangiectases as symptomatic of an angioma in the cheek. The presence of an angioma, of which I think there can be no doubt, accounts for the pulsation felt in the cheek and seen in the tonsillar region of the same side, and for the higher temperature and swelling of the affected cheek. The question arises: 'Have we in this case the same etiological factors as in typical cases of multiple telangiectases, but only localized, or, are the two affections distinct?'"

Family IX (C. O. Hawthorne, 1906).

Marked family history of nose bleed; recurring epistaxis since childhood; telangiectases upon face and hands.

Woman, aged 49.

Family History.—The patient's father and one sister suffered from frequent nose bleed and had spots on their faces similar to those of the patient. She has nine children, all of whom are subject to recurring nose bleed.

Personal History.—Since childhood she has suffered from "bleeding at the nose." On one occasion it was necessary to plug the nostrils. Since her first pregnancy she has been aware of red spots on her face, and also on several of the finger tips of the right hand. There is one situated just under the free edge of the nail which has bled occasionally following slight trauma.

Physical Examination.—"A mere glance at the woman's face was sufficient to show a number of bright red telangiectases scattered over both cheeks, and a few were also seen on the fingers

of the right hand. None were recognized elsewhere, but as the patient came to the hospital merely as a friend of one of the patients and objected to further examination, the condition of the nasal and other mucous membranes could not be ascertained."

Family X (F. Parkes Weber, 1907).

Family history of recurring epistaxis in three generations; development of facial telangiectases at the age of 42; progressively severe epistaxis; simple anæmia.

Jewess, aged 60.

Family History.—The patient's mother, who died at the age of 56, suffered from recurring epistaxis and had numerous red spots upon her face, similar to those on the face of the parent. Three sons and one daughter of the patient are subject to recurring nose bleed and two of the sons show multiple telangiectases on the skin, nasal and buccal mucous membranes. In the third generation two grandchildren of the patient suffer from repeated epistaxis. None of the family bleed abnormally except from the nose.

Personal History.—At the age of 42 the patient first noticed a red spot on her face and she thinks all the spots now present have developed since that time. A few years previous to this her nose began to bleed, on an average, every two weeks. Within the last two years, especially recently, the epistaxis has grown much worse. With the exception of nose bleed, she has never suffered from loss of blood.

Physical Examination.—The patient is a pale, rather fat woman, and she has a number of bright red angiomata distributed over the face, ears, lips, tongue, mucous membrane of mouth and conjunctival surface of all four lids. The telangiectases vary in size from a pin head to one measuring 5 x 7 mm. Several telangiectases are to be seen on the mucous membrane inside both nostrils. On the fingers and under the finger nails are several minute red telangiectases. There is slight œdema of the legs and the veins are varicosed. A blood count shows: erythrocytes, 2,833,000; leucocytes, 11,350; hæmoglobin, 45 per cent. Coagulation time, 5½ minutes, with Wright's tubes. Differential count as follows: polymorphonuclears, 42 per cent; lymphocytes, 45.2 per cent; intermediates, 7.2 per cent; large hyalines, 2.4 per cent; eosinophiles, 2.4 per cent; mastcells, .8 per cent. The red cells show slight poikilocytosis; no normoblasts.

Ophthalmoscopic examination reveals a small patch of chorioretinitis in the right fundus.

Family XI (Phillips, 1908).

Recurring hemorrhages from nose and mouth in three generations of one family; multiple telangiectases of nose and buccal mucous membrane.

"The patient is a married woman, aged 56, who has since childhood suffered from bleeding from the mouth, and more lately from the nose. Her father suffers from violent epistaxis and bleeding from the tongue. Her sister died from hemorrhage of the gums. The patient has one daughter who has vesicular elevations on the tongue and has recently had epistaxis. Near the tip of the patient's tongue is a small red elevated patch which at times spurts out blood freely; there is a small one on the surface of the tongue and one speck behind an alveolus of the upper jaw which also bleeds freely at times. In the right nostril there is a much enlarged vessel seen in the 'locus Kiesselbachi'; on the left side some smaller red spots in the corresponding part of the septum; no lesions in the nostril, pharynx or larynx."

Family XII (Waggett, 1908).

Severe epistaxis; multiple telangiectases of skin of face and mucous membrane of nose and mouth.

"The patient is a man, aged 55, married, but without children, a professional player of wind instruments. He is of robust build, but markedly anæmic, and gives a history of hemorrhage from the nose at very frequent intervals since about the age of 20. He has also had hemorrhage from the face and lips externally. The bleeding is neither better nor worse now than it has been throughout his life. The application of the galvano-cautery to the nose checked the epistaxis for a few weeks.

"He has a sister (not seen) who is stated to have the same symptoms. There is no other family history of importance. Dilated vessels are seen upon Kiesselbach's area on both sides, and it is from these that the epistaxis occurs. Telangiectases are visible on the middle turbinates, the tongue, the edges of the lips and upon the skin of the cheeks externally. Those upon the tongue, about ten in number, take the form of definite circular spots about the size of a millet seed, while on the lips they assume the shape of small hemispherical tumors. The coagulation time of the blood is prolonged, but the exhibition of calcium internally has had no effect upon the epistaxis."

Family XIII (A. J. Ballantyne, 1908).

Family of eight; multiple telangiectases found in five of the six members examined.

The family were Hollanders of the respectable farming class. Attention was first arrested by the appearance of minute red spots on the palpebral conjunctivæ of two of the party, and it was then noticed that similar but larger and much more numerous spots were to be found on the lips and other parts of the skin and mucous membranes. Details regarding the various members of the family follow:

1. Francis van D., aged 63. A thoroughly healthy-looking man. No spots were visible on his skin or mucous membranes, and no history of illness could be elicited.

2. Teuntje, his wife, aged 56. Face and mucous membranes very pale. No emaciation, but looks somewhat old for her years. She has one small red spot on the conjunctiva of the right upper lid, several on the conjunctiva of each of the two lower lids, but none on the left upper lid. On each cheek there is an area covered with a sort of plexus of dilated capillaries, denser at some points than at others, but not forming actual nævoid spots. A somewhat similar condition is found at the centre of the dorsum of the tongue.

Several spots, small, round and of bright red color, are situated in and around the nostrils. On both upper and lower lips are a considerable number of spots of variable size and color.

The conjunctival spots were at first sight taken for small hemorrhages, but closer inspection showed that they were composed of little nævoid clusters of dilated vessels. Hemorrhages are much more commonly found in the bulbar conjunctiva, and these were confined to the palpebral conjunctiva. They were of rounded or quadrangular form, of bright red color, not more than 1 mm. in diameter, and caused no elevation of the surface.

The spots about the nose had the same characters, but were a shade larger.

The spots on the lips varied greatly in size and color. The smaller ones formed little discreet round points, 1 mm. or less in diameter, of bright red color, and with no elevation of the mucous membrane over them. The largest spots were as much as 3 mm. in diameter, of dark purplish color, and formed distinct elevations, some being as large as a split pea. Between these two sizes there were many gradations. Some of the larger ones appeared to have originated by the coalescence of smaller ones.

No history could be elicited of any illness, and she was not aware of any losses of blood which might account for her pallor. Her husband attributed her bloodlessness simply to old age.

3. Marcellus, son, aged 30, now in America, said to be healthy.

4. Gysbertje, aged 26. A tall, well-built, and well-nourished young woman. She has a "pasty" complexion, but does not look quite so pale as her mother. Each cheek shows from ten to fifteen small round dark red spots, unaccompanied by any elevation of the skin surface, and the exposed surface of each lip presents

about the same number of rather large spots. Others, of irregular shape, occupy the tip of the tongue, and there are several on the roof of the mouth. The conjunctivæ of all the lids show several spots like those described in the mother's case. One minute spot is seen under the nail of the fourth finger of the right hand.

The girl gave a history of rather frequent bleedings from the nose, and had been treated with iron for the past three years on account of "bloodlessness." There was no history of other losses of blood, or of illness of any kind. The father stated that she had only been bloodless for three years.

A partial examination of the blood was made in this case. From the skin puncture blood flowed very scantily, and was pale and watery in appearance. There was no tendency to continuation of the bleeding. Dr. A. W. Harrington kindly examined the films, and reports that they show evidence of a pretty marked secondary anæmia. Ring-staining is frequent and poikilocytosis well marked, with a tendency to the appearance of small corpuscles. No nucleated reds are present. Leucocytes are normal.

5. Antoni, son, aged 25, now in America, is also said to be subject to bleedings from the nose, but to be otherwise healthy, and free from the spots described. The latter statement, however, may not be correct, for the spots found on the other members of the family seem to have attracted little or no attention, and may have escaped notice in this case.

6. Jan, son, aged 22, a robust looking young man, perhaps a little pale in the lips, but not noticeably anæmic. He has two small red spots on the tip of the nose, and about a dozen, large and small, on the inner surface of the lower lip. All round the tip of the tongue are a number of small red elevated spots, having the appearance of unduly vascular papillæ. In his case no history of illness, epistaxis or other losses of blood could be discovered.

7. Gysbert, son, aged 18, a healthy youth. No spots found, but the condition of the tongue similar to that in Jan.

8. Francis, son, aged 13, also healthy and showing no spots, but the same condition of the tongue as in the two preceding cases.

None of the cases were specially liable to bleeding from cuts, and no accidental hemorrhage from the nævoid spots had been noticed.

No other relatives were known to have a similar affection.

In the above series of cases the mucous membranes of the throat and nose, the external auditory meatus and the skin of the body and limbs were not examined.

Hereditary Hemorrhagic Telangiectasia: A Clinical Picture.

Definition.—An hereditary affection manifesting itself in localized dilatations of capillaries and venules, forming distinct groups or telangiectases which occur especially upon the skin of the face, nasal and buccal mucous membranes and give rise to profuse hemorrhage either spontaneously or as the result of trauma.

Etiology.—Three factors seem of etiological import; namely, heredity, repeated traumatisms and the abuse of alcohol.

Of these three factors the hereditary tendency to the disease is by far the most striking and constant. With the single exception of hemophilia, there is no other disease which, so like a nemesis, pursues its victims through successive generations. There is in the literature no instance of a patient suffering with this affection and having children all of whom were free from the disease. Males and females are affected alike and both are equally capable of transmitting it to their offspring. To define with greater particularity this "hereditary tendency" would be a pleasure; to find the specific fault which underlies the disease is a problem of the future.

Repeated traumatisms certainly seem to play a part in the production of the telangiectases. The ears, the cheeks, the muco-cutaneous junction of the lips, the nasal and buccal mucous membranes, the finger tips—these are the sites of predilection and these are obviously the points most subject to frequent slight traumatisms. This, however, is only theoretical; a more specific instance has been detailed in the case of John F. R. (Case II). He had the misfortune to run a large splinter under a finger nail and the consequent suppuration caused the nail to come away. Eventually a new nail grew, and under it two large telangiectases were observed to have formed. These bleed so readily and profusely upon slight injury to the nail that the man's work has been seriously impeded.

The abuse of alcohol as an etiological factor is a personal impression gained from the study of my first family and only meagerly supported by the evidence of other writers. It is true that in most of the cases reported there is neither positive nor negative mention of alcoholic abuse. Osler's first three cases are exceptions. The first two were sailors, much given to those alcoholic habits so common in sailors; the third patient came from Kentucky. Theodore Raymond (Case III) has many more telangiectases than any other member of his family. He earns a fair wage and "drinks when he has the money." His uncle also had a profusion of facial telangiectases which he, with commendable candor, called "whiskey bumps." The vasodilator action of alcohol upon the peripheral capillaries may be mentioned with relevance in this connection.

Morbid Anatomy.—Upon inspection of the red spots characteristic of the disease it becomes obvious that they are true vascular formations and not blood extravasations. They blanch on pressure and regain their color when the pressure is removed. Those occurring upon the face are very prone to show the typical spider-nævus formation.

Figure 2 is an excellent reproduction of a microscopical section from a telangiectasis removed from the cheek of Theodore R. (Case III). The obliteration of the papillæ of the corium, together with the absence of the usual undulations of the stratum germinativum, is very striking. This is doubtless due to the relatively enormous dilatation of the blood vessels of the corium which are seen as wide spaces lined by a single layer of endothelium lying immediately subjacent to the greatly attenuated epidermis. These dilated vessels can be traced well down into the subcutaneous fatty tissue. A study of sections stained by various special methods failed to reveal any muscular or elastic tissue in the walls of the dilated superficial vessels, although the less dilated vessels in the subcutaneous fatty tissue show the normal arrangement of the tunicæ.

When one notes the very scanty protection afforded the dilated vessels by the thin epidermis it is no longer surprising that trivial traumatisms produce marked hemorrhage.

Subjective Symptoms.—Hemorrhage is the one constant



FIG. 1.



FIG. 2.

B. V. = Blood Vessels.
C. B. = Collapsed Blood Vessels.
Epi. = Epidermis.
H. = Sheath of Hair Root.
Gl. = Gland of Hair Follicle.

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FIG 3.



FIG. 4.



FIG. 5.

symptom of the disease and the source of all other symptoms. It takes in the great majority of cases the form of epistaxis, but this symptom may be entirely wanting. The hemorrhages always originate in telangiectases. Next to the nasal telangiectases those on the lips and buccal mucous membrane most frequently cause bleeding. The hemorrhages are astoundingly profuse; patients deseribe the blood as spurting from the injured spot. The nose may bleed freely several times each day, and while lay deseriptions of hemorrhage are to be taken *cum grano salis,* personal observation upon several occasions has convineed me of the severity of the epistaxis. Secondary anæmia follows as a natural sequence of the frequent and profuse hemorrhages, and the concomitant symptoms of palpitation, breathlessness and swelling of the ankles beeome painfully evident. The hemorrhages produce anæmia, the anæmia conduces to hemorrhage, and thus a vieious cyele is inaugurated, each symptom playing the double rôle of cause and effect.

Objective Symptoms.—Multiple telangiectases constitute the sole characteristie sign of the affection. Their occurrence is most eonstant upon the nasal and buceal mucous membrancs and the mueo-cutaneous junction of the lips. They have been observed upon the skin of the face, hands and feet, upon the scalp, the conjunetivæ, and once post-mortem in the gastric mucous membrane. They begin as dilatations of the capillaries, having a bright red eolor. As they increase in size the venules participate in the ectasia, giving the cutaneous telangiectases a violaceous or purple color. The telangieetases of the mueous membranes are always brilliant red. The small telangiectases do not project beyond the surrounding struetures, but as they increase in size they tend to beeome more elevated. They never attain to a great size; a split pea seems to represent approximately their maximum development. They are true developmental faults, beginning in early ehildhood, frequently eausing increasing annoyance during adolescence and becoming serious menaces to health toward the evening of life.

Diagnosis.—There exists no reasonable diagnostic difficulty. The association of multiple telangiectases of the skin and mucous membranes with rccurring hemorrhages from these telangiectases is highly characteristic. The disease has been referred to as a hemorrhagic diathesis—a term which not only covers all the symptoms, but conceals most of them. The more specifie mistakc of diagnosing the condition as hemophilia has been made repeatedly (Lcgg, Chiari, Chauffard, Coe). The error was in each instance one of interpretation rather than of observation. The diseases are so dissimilar that the presence of one renders the existence of the other highly improbable. Their coexisteuee is conceivable, but such a eircumstance must be regarded as a fortuitous coincidence.

Treatment.—The therapeutie indications are clear. Destruetion of the culpable telangiectases should be the first consideration. A bead of chromic acid fused upon a probe is an excellent eauterizer and its action can be checked at any time by the application of an alkali. Repeated cauterizations may be necessary, especially within the nose, for here the bleeding frequently takes place from very small telangiectases which are easily overlooked. The patient should be instructed to report for treatment, if possible, each time the nose bleeds, for it is only by the repeated destruction of small telangiectases that one can check the epistaxis and at the same time avoid widespread cicatrization of the mucous membranes. It is futile to treat the secondary anæmia so long as the hemorrhages continue. Remove the cause and the effect is readily amenable to treatment.

The disease is a definite clinical entity and as such deserves a specific name. I suggest that the affection be called *Hereditary Hemorrhagic Telangiectasia,* a name which I believe not only adequately deseribes the condition, but conforms to the strictest rules of medieal nomenclature.

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THE PLACE OF PROTOZOOLOGY IN THE MEDICAL SCHOOL CURRICULUM.

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Every advance in seientifie medicine means an increase in the amount of work required of the medical student. In the past few years the study of the protozoa has added many facts of more or less direct bearing upon medicine. Investigations into the etiology and the pathology of a number of diseases have made protozoan study a subject of ever increasing importance to the medieal man. This increasing importanee was first recognized, in a large way, by the appointment of the lamented Schaudinn to the directorship of the newly-created division of protozoology in the Imperial Bureau of Health of Germany, and later by the establishment of courses in protozoology in a number of medical colleges. I have no desire to submit any arguments as to the neeessity of further increasing the work of the medieal student by creating a new course, but wish rather to indicate some of the ground that such a course should cover in order to justify its creation. If the purpose of protozoology were merely to increase the student's knowledge of the etiology and the pathology of a number of diseases the establishment of a separate course would hardly be justifiable. The same ground could be covered by incorporating the matter into the work on bacteriology and pathology. When, three years ago, it beeame the duty of the writer to attempt to give to the students in the Medical Department of Western Reserve University some idea of protozoology it seemed that the course should include something more than a mere catalogue of protozoa whieh causc disease in the human being. It was felt that the purpose of the course should be a threefold one: to give a general survey of the biology of the protozoa, to train the individual student's powers of observation and to indicate the relationship of the unicellular animal organisms to disease.

In the Western Reserve Medical College bacteriology and pathological histology are taught during the second year, bacteriology running from the beginning of the year until the Christmas vacation, and pathological histology from the resumption of work after the vacation until the end of the year. Because of its close relationship to both of these subjects protozoology is also given during the second year. The only time available upon an already well-filled schedule was during the first month of the year, a time at whieh the study of bacteriology is begun but a time at which the student has not yet had any work in pathological histology. Not only is the period of forty hours at my disposal during this month too short a time for covering the ground, but it is impossible properly to discuss the relationship of protozoa to disease at a time when the student has no knowledge of pathology. A division of the work was, therefore, decided upon. The month alloted to protozoology is occupied with a study of protozoan biology and with attempts to train the student's powers of observation. The discussion of the etiological relationship of the organisms constitutes part of the course in pathologieal histology.

A few words as to the advisability of including in the course something more than the pathogenic relationships of the protozoa may not be out of plaee.

Protozoan Biology.

A review of general protozoan biology is of value to the student, not only beeause of the mental training that it may give, but also because many of the faets brought out by a study of the protozoa are applicable to other subjects with which the student must become familiar. Cellular pathology, in so far as it is really cellular pathology and not tissue or organ pathology, is at a standstill and can advanee little further by the methods at present in use by pathologieal investigators. The great bulk of pathological histology of the present day occupies itself ehiefly with descriptions of variations in the results of pathological processes and with a cataloging of the variations in the finer architeeture of tumors. That portion of the literature which does deal with abnormal individual cells concerns itself only with the morphology of such eells and makes little or no attempt to correlate the differences in morphology with altered function or with alterations of the normal biological relationships of the cells. Many of the faets which have resulted from the work of recent years upon protozoa will prove to be of direct value when applied to pathology. The work of Maupas, R. Hertwig, Calkins and many others upon the eonditions of depression and senility in protozoa and upon the means by which protozoa may recover from such conditions; Hertwig's theories eoncerning the relationship existing between nucleus and cytoplasm and the results of disturbanees of this nucleus-plasma relationship; the establishment of the bearing of extranuclear chromatin upon the physiology and the reproduction of the cell; Schaudinn's views coneerning the dual nature of the nucleus; all of these are ideas rich in promise when applied to a number of problems in general pathology. Autochthonous pigmentation, degeneration and necrosis, hypertrophy and hyperplasia, and tumor formation offer fields for the application of the general biological prineiples enumerated.

Normal physiology deals chiefly with tissues and organs. A large part of physiological investigation, with the notable exception of the kind carried on by Rhumbler, Verworn, Jennings and a few others, still has far to travel before it begins to realize that the eell theory had its beginning in 1838, and that, ultimately, the explanation of normal physiological proeesses must be dependent upon a knowledge of normal eellular activity. Verworn has made a most earnest plea for the development of a real cellular physiology, based upon the study of the protozoa. Certainly many of the problems conneeted with the reactions of living matter to stimuli, with cellular metabolism, with reproduction, and with seeretion and excretion

may hope for partial elucidation from experimentation upon protozoa.

If cellular pathology and physiology are to advance the progress must be, to a large extent, along the lines of investigation indicated. In order that the well-trained physician of the future may have the sort of training which will permit him to appreciate the additions that will certainly be made to pathological and physiological knowledge he should have at least a superficial insight into so much of protozoan biology as may become applicable to the problems in these fields.

Not only is the biology of the protozoa of importance because it may help in the elucidation of certain pathological and physiological problems, but also because a broad knowledge of many of the diseases caused by protozoa is dependent upon the ability to realize the close relationship existing between the biology of the pathogenic protozoa and the clinical and pathological manifestations produced by them. It is essential for the physician to know that a diagnosis of malaria is justifiable if, in addition to certain clinical symptoms, the red blood corpuscles show certain characteristic changes. It is likewise essential that a child of the most ordinary mental attainments should know that $2 + 2 = 4$. In either case the mind is in possession of certain facts which need not necessarily indicate a very high degree of intellectual development. When the child learns that $2 + 2 = 4$, not because of any magic properties inherent in the symbol, 2, but because each portion of the left-hand side of the equation can be further simplified into $1 + 1 = 2$, mental qualities of a comparatively high order have been developed. The development is comparable to that possessed by the medical student who realizes the very intimate relationship existing between the biology of the malaria parasite and the symptomatology, the pathology, the treatment and the prophylaxis of the disease. The student who is able to correlate the paroxysm of malaria with the sporulation of the parasite, the anemia and the changes in the internal organs with the destruction of the red corpuscles, the relapse with the parthenogenesis of the makrogametocyte, the cure of the disease with the effect of quinin upon the parasite, and the mosquito with the sexual cycle of the parasite, will be in possession of facts which he has obtained by reasoning from cause to effect. The value of his knowledge is directly proportional to the development of his reasoning powers.

The Training of the Powers of Observation.

In the experience of the writer a large proportion of students have great difficulty with pathological histology. Theoretically, the student who has had a course in normal histology ought to be able to recognize the morphological characteristics of the various kinds of tissue cells. When, however, he attempts to apply this knowledge in the study of a simple inflammatory lesion, for instance, he is apt to lose himself. He seems to think that a pus cell, because of its presence in an inflammatory exudate, is a pus cell and not a leukocyte. The fibroblast, because of its occurrence in a pathological process, is a new type of cell—in the mind of the student it seems to have no relationship whatever with a young connective tissue cell. The trouble is apparently due to an inability to reason or to co-ordinate facts already in his possession. Many factors may be concerned in this lack of power properly to associate ideas. One of the most important appears to be the nature of the undergraduate training. Memory is developed at the expense of reason, and the most brilliant Bachelor of Arts is apt to be the student with the most retentive memory. If he continues to depend almost entirely upon memory he becomes a very mediocre student of a subject like pathological histology.

The study of free-living protozoa ought to be helpful in overcoming this tendency toward relying upon memory alone. The student can readily see the differences in the type of locomotion possessed by a ciliate, a flagellate and an ameba. If, then, he is able to say that a given organism, which he has never seen before, is probably a ciliate because of its type of motility he has called into play something more than a retina and a memory. The study of living organisms is considerably more difficult than the study of a stained section of an abscess, but it is this very difficulty which helps to train the powers of observation. The mere necessity of moving the slide in order to follow a swimming protozoon may be helpful in establishing a condition of mental alertness.

The Pathogenic Action of the Protozoa.

The study of the reactions of the tissues to protozoan infection is the simplest portion of protozoology. Given a knowledge of protozoan biology sufficient for an understanding of the ways in which protozoa may act upon the tissues, and observational powers sufficiently well trained to recognize the resulting changes when seen—and the student ought have no difficulty with the pathology of protozoan infections.

Outline of the Course.

That portion of the course which deals with the organisms themselves and with their life manifestations, rather than with their relationship to disease, is arranged according to the outline which follows.

The work begins with a study of such free-living, fresh-water protozoa as can be readily obtained. The number of species studied varies, of course, from year to year, because the protozoan fauna of the ponds which furnish the material may show some variations. Whatever the species used, the range is always sufficiently wide to illustrate the more important characteristics of the rhizopoda, the flagellata, the ciliata and the suctoria. This part of the work is not undertaken from the standpoint of systematic zoology, but with the view of developing the powers of observation and in order to illustrate, upon living material, the variations in morphology produced by specialization and differentiation. The structure of protoplasm, the differentiation of the cytoplasm into ectoplasm and endoplasm and the complex variations which specialization has produced in the external organelles are studied. The student is constantly reminded of the fact that the protozoa are not only single cells, but also individuals, and as such are

subject to the same conditions and the same laws which govern metazoan individuals. All of our students have had undergraduate courses in biology. As an aid to that portion of protozoan biology which, for the reasons given earlier, is held to be necessary this undergraduate work is a negligible quantity. The number of species is usually so small as to give a totally inadequate idea of the protean characters of the protozoa. Furthermore, these courses are usually so arranged that the majority of the students carry away with them only the idea that the protozoa are animals, and as such are to be grouped with the other animals studied in the course. They do not seem to get hold of the two fundamental ideas that the protozoa are single cells and that they are individuals. I do not wish the above remarks to be construed into an argument against the value of such instruction in biology as the student receives during his undergraduate course. But I do feel that the average course in biology does not sufficiently emphasize the special details which the ever-increasing importance of protozoology demands. Protozoology, if it is to be included in the medical curriculum as a separate course, should be considered in such a way as to make it a subject distinct from comparative zoology, but its actual present relationships and its possible future relationships to bacteriology, pathology and physiology should always be kept in mind.

The study of the resting protozoan nucleus follows the work dealing with the external characteristics of the organisms. Variations in nuclear morphology, while interesting, are not so important as the diverse relationships which the several nuclear constituents may show to each other and to the morphological nucleus. Certain conceptions concerning nuclear substances, conceptions with which his previous work has not at all familiarized the student, receive particular attention because of their importance to cellular physiology and pathology. Of these may be mentioned the distribution of the chromatin without the formation of a definite nucleus, illustrated by certain stages in the cycle of the malaria parasite; the presence of vegetative extranuclear chromatin, as occurs in Actinosphærium; and reproductive extranuclear chromatin, as in Arcella.

The division of the protozoan nucleus also deserves attention because of the variations exhibited by protozoan karyokinesis, because of the help that a knowledge of these variations may give in understanding the mitosis of metazoan cells and because this portion of the subject leads naturally to the most important chapter in protozoan biology, that dealing with sexual processes and with life cycles. For the study of nuclei stained preparations are necessary and, in so far as is possible, use is made of stained examples of organisms which were studied earlier in the living condition. In the work on morphology and on the nucleus the constant aim is to compare protozoan characteristics with the most nearly related ones of those metazoan cells with which the student ought already be familiar.

Conjugation, copulation, the sexual differentiation which may be associated with these two processes, and the sequence of morphological and nuclear changes which constitute the life cycle form the most difficult chapter in protozoology. Difficult, because of the widespread application of the facts concerned and because these facts must be presented largely in a didactic manner. Great as is the difficulty connected with this chapter its importance is even greater, a point to which Calkins has called attention. It is not to be supposed that every second-year student will develop ultimately into an investigator of pathological problems, nor should it be the aim of a medical school course to attempt to produce finished protozoologists. But even an elementary knowledge of protozoan biology, particularly of that portion dealing with the nuclear variations of different species and of a single species during the various stages of its life history, would have prevented the discovery of many of the pseudo-protozoa which are met with all too frequently in pathological literature.

The first portion of the course ends with a discussion of the correlation of protozoan biology and parasitism. The results of parasitism are considered from two standpoints, that of the parasite and that of the host. It is of value to understand what changes parasitism has produced in the morphology and the life histories of protozoa, the parasitic forms being compared with the most nearly related free-living ones. The effect of parasitism can be considered at this time in a superficial manner only, because the student does not yet have any knowledge of the fundamental principles of general pathology.

The work in protozoan biology is given in three hour periods, the first hour being devoted to didactic and the final two hours to laboratory work. As already stated, living forms are used whenever possible. When these are not available for the illustration of any particular portion of the subject stained preparations are used. As many of the parasitic and pathogenic forms as can be obtained are included. The student is required to make drawings and detailed written descriptions throughout the work.

The relationship of the protozoa to disease constitutes part of the work in pathological histology. In the latter course, as at present given in the Western Reserve Medical School, the general subject of inflammation is followed by a group of conditions included under the heading, "Special Infections." In this subdivision a number of bacterial infections, pneumonia, typhoid fever and others, are considered as disease entities. Typhoid fever, for instance, is studied not as an intestinal inflammation but as an infection which leads to reactions on the part of organs other than the intestine. In the consideration of diseases due to protozoa special attention is paid to so much of the biology of the parasite as is helpful in explaining the reaction produced by the parasite. In the "Special Infections" group are included the amebic infections, trypanosomiasis, the spirochætoses (exclusive of lues), coccidiosis, malaria and the intestinal parasites. The group includes also certain conditions of probable protozoan etiology, rabies, variola and vaccinia; and diseases of possible protozoan origin or diseases in which protozoa or pseudo-protozoa have been described, as the acute exanthemata, leukemia and Hodgkin's disease. Syphilis is discussed as a protozoan infection under the infectious granulomata.

The outline above is not submitted with the idea that the course is a perfect or an ideal one. But bearing in mind the premise stated at the beginning, that protozoology to justify its establishment as a separate course ought to include a certain amount of general biology; and bearing in mind also the time and the material available, as well as the educational acquirements and deficiencies of the students, the work outlined seems to cover the ground desired. Any further development of our knowledge of the protozoa ought, perhaps, be equally divided between the biology and the pathology of the subject. The ideal course would be one in which protozoology is only a part of medical zoology, a course which should include the biological and pathogenic relationships, not only of the protozoa, but also of the parasitic metazoa.

A CASE OF GENERAL INFECTION WITH *BACILLUS MUCOSUS CAPSULATUS* FOLLOWED BY AN AREOLAR ABSCESS OF THE LIVER AND GENERAL PERITONITIS. AUTOPSY.

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(*From the Pathological Laboratory of the Lakeside Hospital, Cleveland, Ohio.*)

Primary idiopathic abscess of the liver, except in cases of direct or indirect traumatism, may be said very seldom to occur. In direct traumatism a penetrating dagger, a splinter of wood, a bullet or the like, may carry in with it infecting organisms and suppuration may follow. In indirect traumatism, as by a blow or fall on the hepatic region, the liver may receive severe injury, some of its blood vessels may be ruptured, hæmorrhage may take place into the parenchyma, and the resistance of the organ be greatly lowered. It may form as a result of such injury a fertile soil for the growth and multiplication of organisms, which would otherwise not be attracted to it, or whose virulence normal liver tissue could readily withstand. In all other cases of hepatic abscess we must, ordinarily, consider the condition secondary to a focus in some other region of the body. The source of infection may be at times comparatively small, insignificant, and easily overlooked. Josserand (1) has reported a case of amœbic abscess of the liver occuring ten years after an attack of dysentery. In such a case the infectious focus must be of the nature of a chronic inflammation. The amœba must have been lurking and living in some portion of the body and there producing a certain amount of irritation, though not enough, perhaps, to produce any manfestly discernible symptoms. However, there are cases on record (2) of undoubted abscess of the liver, in which amœbæ were found in the abscess, but no history of preceding dysentery could be obtained, and in which post-mortem examination showed a normal gastro-intestinal tract. There is, also, recognized by some authors (3) a group of cases of infective suppurative hepatitis with abscess formation in which the utmost care has failed to reveal, either during life or after death, any primary point of infection.

The clinical history of our case is as follows, and seems to belong to the above described third group:

A. J., white, American, æt. 23, married, book-keeper, entered hospital April 30, 1908.

Complaint.—Fever and abdominal pain.

Family History.—Unimportant.

Personal History.—Unimportant.

Present Illness.—Patient has not felt like work for the past ten days. Four days before admission to the hospital he was seized with fever, which has persisted without remission. The next night he had irregular fleeting pains in the upper right chest and a dull constant pain in the upper right abdomen and back. He also had headache and a feeling of chilliness. He vomited frequently that night, but has not vomited since. On the day before admission he had a severe chill. He has never been jaundiced.

Physical Examination.—On admission, temperature, 103.4° F.; pulse, 92; respirations, 22 to the minute.

Patient is fairly well developed and rather poorly nourished. Face is flushed. Herpes on lips. Tongue is dry and coated with a white fur. The superficial lymph glands are not enlarged.

Thorax.—Normal.

Abdomen.—Liver extends from the 4th rib above to 2.5 cm. below the costal margin. Its edges are not palpable. Palpation is very painful over the right lobe of the liver, but less so over the left lobe. Deep palpation is slightly painful in the right iliac region. Abdomen is not distended. Spleen apparently enlarged, palpable just below the costal border.

May 2.—Epigastric pain, which has been very severe, has now markedly decreased. His abdomen is quite distended, especially below the umbilicus.

Operation.—Exploratory laparotomy and drainage by Dr. D. P. Allen.

On opening the abdomen the liver seemed somewhat enlarged. The hepatic flexure of the colon was drawn up and found covered with fibrino-purulent exudate. The cœcum and appendix were exposed; the latter was free and not enlarged; its peritoneal surface was dull and partially covered with seropurulent material. The pelvis was explored and found full of thick yellowish pus. The peritoneal coat of the small intestine was found injected and quite dull in appearance. No perforation could be found. Owing to the patient's poor condition it was thought unwise to attempt further to discover the source of the pus.

May 5.—On the day following the operation, May 3, the patient looked brighter and his general condition had improved. Late in the afternoon of May 4, his temperature began to rise and he became restless. During the following night his pulse became weak and rapid; by morning it was weaker and more rapid; he was at times delirious, and died at 8.15 p. m.

Urine.—At no time, either before or after operation, did the urine show anything of importance.

On May 4, the day before the patient died, a blood culture taken, under aseptic precautions, from the median basilic vein of the right arm gave the *B. mucosus capsulatus* in pure culture. Its appearance and general characteristics, as well as its cultural growth, were identical with the organism obtained at autopsy and described in the bacteriological report of this paper.

Autopsy, 938.

May 6.—13 hours after death.

Anatomical Diagnosis.—Acute, general, diffuse, fibrino-purulent peritonitis; areolar abscess of liver; general infection with B. mucosus capsulatus; parenchymatous degeneration of the heart muscle, liver, kidney, adrenal and pancreas; acute lymphadenitis; acute splenic tumor; œdema and congestion of lungs.

Abdominal Cavity.—The abdominal wall is quite thin; the subcutaneous fat scanty. The serous surface of the abdominal wall and viscera is everywhere covered with a layer of thick greyish-white purulent material of very foul odor. Beneath this exudate the surface is deeply injected and dulled. The inner surface of the abdominal wound is quite ragged, its margins ulcerated and covered with fibrino-purulent exudate. The omentum is massed on itself and drawn over to the left hypochondriac region. It is matted together by fibrino-purulent adhesions and its surfaces, with the serous surfaces in general, are covered with fibrino-purulent exudate. All the abdominal fossæ and dependent portions of the cavity are filled with soft creamy pus. The appendix is free, short, straight and firm. Its tip lies over the brim of the pelvis in a pool of pus.

The liver reaches 10 cm. below the costal margin. The surfaces of both lobes are covered with fibrino-purulent exudate. This may be stripped off in sheets from the upper surface. The surface is deeply congested and red. On passing the hand upwards between the diaphragm and the liver, the liver substance readily yields to pressure and there is distinct fluctuation. The gall-bladder, filled with bile, appears normal.

The spleen is enlarged and soft. It is adherent to the diaphragm, fundus of the stomach, and abdominal wall by delicate fibrino-purulent adhesions.

Examination of the whole alimentary tract, from the œsophageal opening of the stomach to the anus, shows no perforation.

Liver.—It weighs 2000 gr. It measures 25 x 22 x 9 cm. Its peritoneal surface is everywhere covered with a membrane-like layer of fibrino-purulent exudate. Beneath this membrane, which may be readily stripped off in sheets, the liver surface of the left lobe appears of a fairly uniform light greyish-yellow color. The surface of the right lobe shows marked mottling, especially over its posterior portion. Over this region of the right lobe the surface is of a general dark red color, dotted at several points with irregularly quadrilateral and round, opaque, soft areas, varying from 1-2 cm. in diameter. Over these opaque areas the surface is roughened and in some places broken. Where they are broken they are seen to open into subjacent abscess cavities. The anterior portion of the right lobe is fairly soft and friable; the posterior portion, quite soft and fluctuating. On pressure, greyish-white, foul-smelling, purulent material may be pressed out through the openings on its surface. Beginning at a point on the outer border, 5 cm. from its anterior extremity, there is an irregularly triangular area, measuring 10 x 8 cm., throughout which the liver surface is deeply injected and of a dark red color. At its base it merges into the abscess area in the posterior portion of the lobe. On section the cut surface of the anterior portion of the right lobe and the whole of the left lobe have, practically, the same appearance. It is of a pinkish-yellow color, soft and friable. The lobules are readily made out and the central veins are visible as small, injected, red points. The central veins are surrounded by an ill-defined ring of light yellowish-grey tissue, slightly translucent. Outside of this the tissue of the portal spaces is darker and more opaque. Section through the triangular area described above, shows a cut surface of deep red color and slightly mottled. The tissue is of a softer consistency than that in the anterior portion of the lobe. The lobules are very indistinct and ill-defined. The blood vessels are distended and filled with greyish-red, fairly firm thrombi. Scattered over this area, increasing in number as we proceed posteriorly and towards the outer border, there are numerous greyish-white points, varying in size from a pin point to 1 cm. in diameter, and from which on pressure soft tenaceous opaque material may be expressed. These points can be readily seen to be situated in the hepatic veins.

The Abscess.—A section through the posterior portion of the right lobe shows an irregular eliptoid area, measuring 10 x 9 x 7 cm., with a fairly well defined border separating it from the surrounding deeply congested liver tissue. Over this area the tissue is seen to be made up of a network of intercommunicating sinuses and alveolar spaces, filled with greyish-white, foul-smelling, tenacious and viscid purulent material. The intervening septa of liver substance have a slightly tortuous radial arrangement. The veins contain deep red and reddish-white thrombi. On opening the inferior vena cava a thrombus is found projecting for a distance of 1 mm. from the main hepatic vein. On pressure purulent material may be expressed from the hepatic veins into the lumen of the inferior vena cava.

The portal vein, when examined throughout its course and as far into the liver substance as its branches can be readily followed, is everywhere free and shows no thrombi, emboli or evidence of pylephlebitis.

Microscopical Examination.

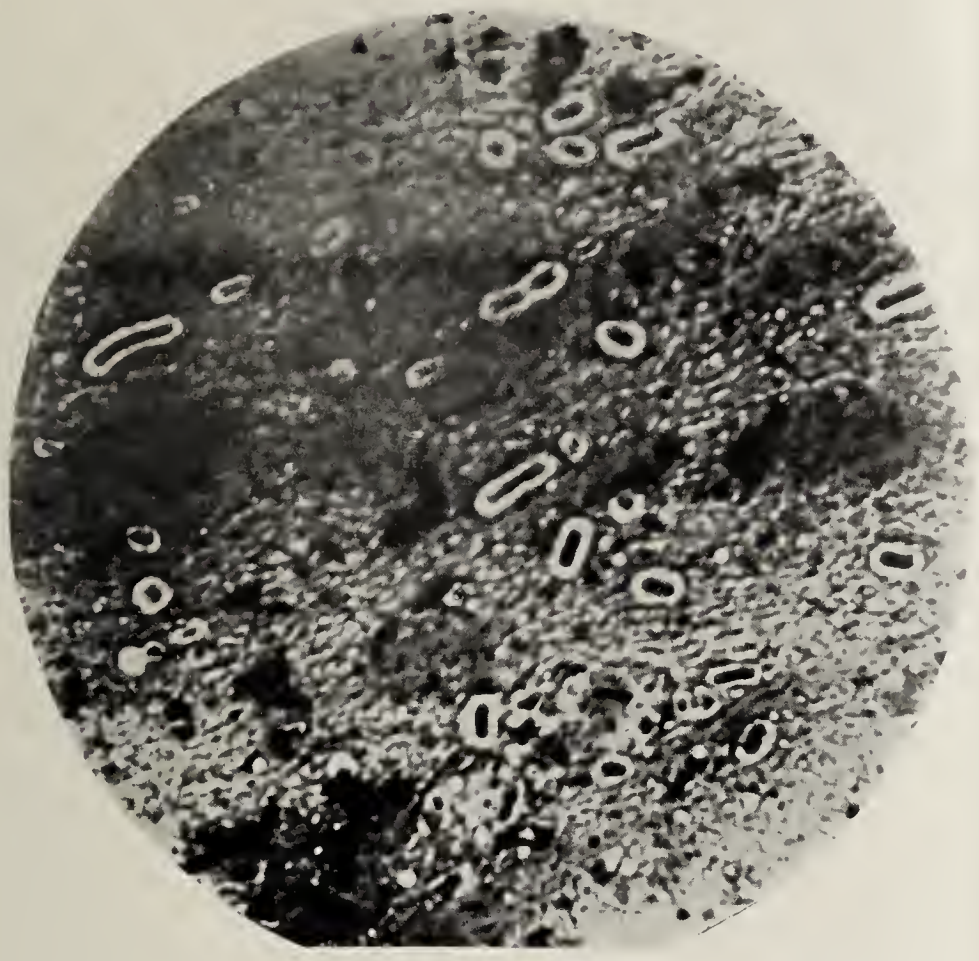
Liver.—Examination of the abscess-area shows the abscesses to have a fairly uniform structure. Proceeding from the center of one of the abscesses towards the periphery, we meet, first, a vacuolated, pink-staining area of necrotic structureless material; outside of this area there is a darker zone of densely packed and deeply staining leucocytes, small round cells, broken liver cells and granular material; along the outer border of this zone there is an irregular line of bacilli; outside of this line we have the degenerated cells of the liver parenchyma and of the septa that run between the abscesses. These septa vary in width. Scattered through them are numerous areas of small hæmorrhages. The bile ducts are well preserved and are undergoing active hyperplasia. Beneath Glisson's capsule there is a zone of round cell and leucocytic infiltration. The blood vessels are dilated and distended with blood.

Sections from the anterior portion of the right lobe, just anterior to the abscess-area, shows numerous small and large solitary abscesses, which appear as local areas of suppurative phlebitis, always associated with a hepatic vein. The lumen of the vein is filled with polymorphonuclear leucocytes, small round cells, broken endothelial cells and granular material. Bordering on and in the wall of the vessel are numerous bacilli, often aggregated in clusters. In the large areas the wall of the vein has been almost destroyed and exists only as a ring of degenerated connective tissue cells; in the smaller areas it is fairly well preserved. Outside of the vessel wall there is a band of broken liver cells and marked leucocytic and small round cell infiltration. In the very smallest abscesses the suppuration is limited almost entirely to the lumen of the vessel.

In the remaining portion of the right lobe and throughout the left lobe there is only acute congestion of the blood vessels and parenchymatous degeneration of the liver cells. The connective tissue about the portal spaces is slightly increased and there is round cell infiltration. There is nowhere any evidence of an acute cholangitis, either in the small or large bile ducts.

Bacteriological Report.

Smears were made from the fibrino-purulent peritoneal exudate and from the purulent material obtained from the large liver abscess. The bacteriological picture is identical in both preparations. With the gentian violet stain there is seen a large plump bacillus, varying in length from 3-8 μ, with rounded ends and a distinct halo about each organism. With Welch's capsule stain distinct capsules can be made out about each organism. No other organisms could be seen. No amœbæ or other protozoan organ-



A smear from one of the liver abscess cavities, stained with Welch's capsule stain. A smear from the peritoneal exudate, stained in the same manner, shows a similar picture. × 1000.



One of the smallest vessels, showing the lumen of the hepatic vein filled with purulent material and the leucocytic infiltration almost entirely limited to the vessel wall. × 100.

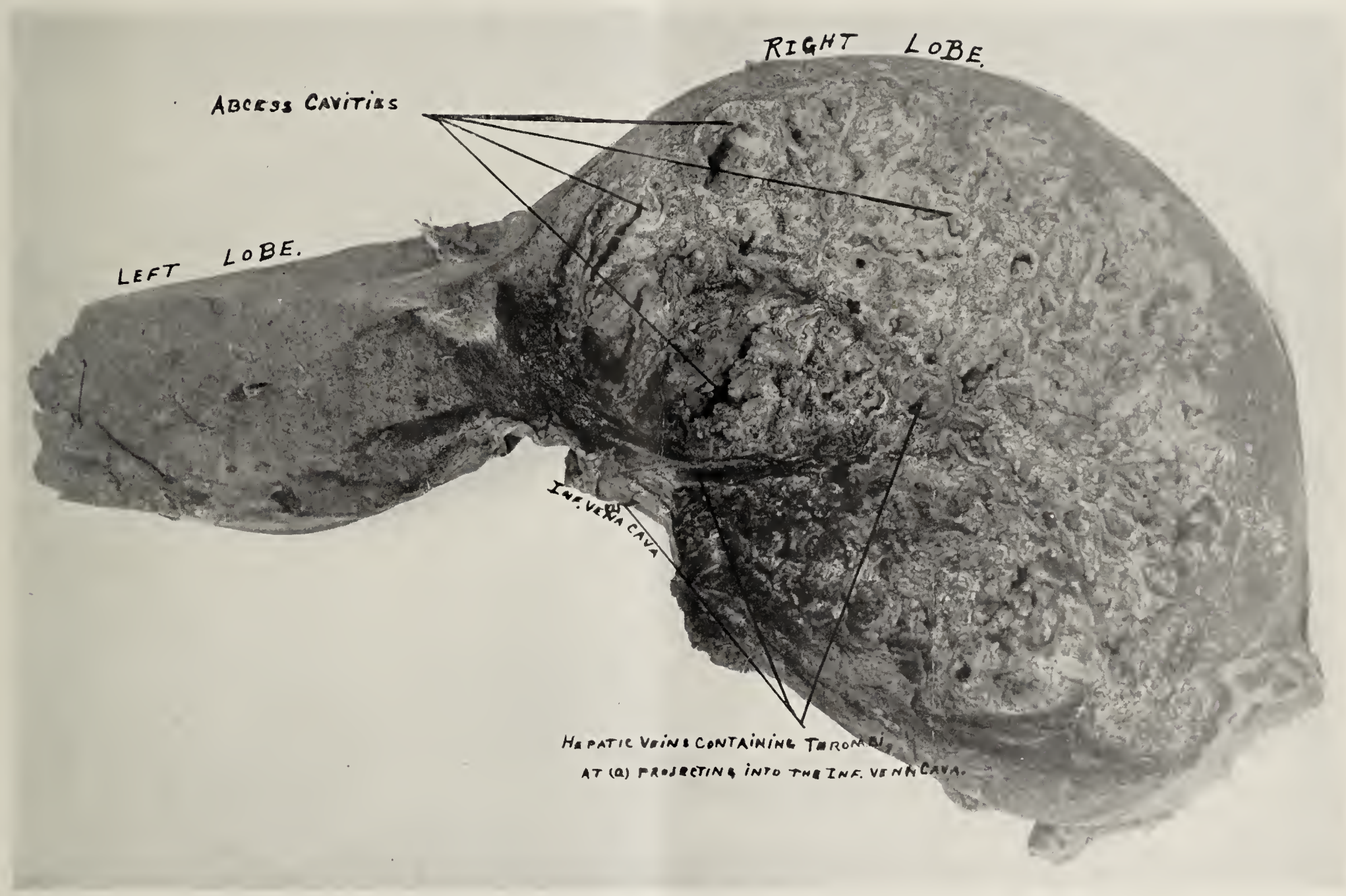


A portal space, showing nothing abnormal, save a slight round cell infiltration and slight increase in the connective tissue. × 100.



A section of one of the smaller abscesses situated just anterior to the large areolar abscess showing (a) the lumen of a hepatic vein filled with purulent material, (b) the ill-defined vessel wall, and (c) the marked leucocytic infiltration around the margin of the vessel. × 100.

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The appearance of a cross-section of the liver, made about 10 cm. anterior to the posterior extremity. × 1.

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isms were found in the liver abscesses. The organism found decolorized with Gram's stain.

Cultures made on plain agar from the heart's blood, liver, spleen, lung and kidney were positive in all save those from the spleen. The cultures in all were pure and their growths identical.

The organism obtained from the cultures is about .5 μ in width, has rounded ends and varies from 3-5 μ in length. It decolorizes with Gram's stain, has no spores, and is non-motile. After 24 hours incubation at 37° C., its cultural growth are as follows:

Plain Agar.—There is an elevated white lustrous growth with wavy margins. When touched with a platinum needle it is seen to be very tenaceous and mucus-like. Subsequent growth showed no marked change.

Glucose Agar.—Stab cultures showed marked gas formation, portions of the media are raised 1 cm. above adjacent portions.

Litmus Milk.—There is coagulation and acidification. Cover slip preparations stained with Welch's capsule stain showed distinct capsules. Subsequent growth showed no peptonization.

Plain Bouillon.—There is a diffuse turbidity and slight greyish-white sediment. Subsequently the turbidity greatly increased and a distinct pellicle formed.

Potato.—There is a rather diffuse greyish-white growth, quite moist and viscid, with marked gas formation in the water of condensation along the side of the tube.

Dunham's Bouillon.—There is a growth similar to that noted in the plain bouillon. After 12 days there is a fairly marked indol reaction with 10 per cent sulphuric acid and 1 per cent sodium nitrite.

Gelatin.—After 3 days growth at room temperature (about 20° C.), there is a distinct growth along the stab and an accumulated growth on the surface, giving a nail-head appearance. There is no gas formation or liquefaction. Subsequent growth showed no change.

Blood-serum.—There is a lustrous white growth along the line of stroke. It is very tenacious and stringy when touched with a platinum needle. Its margins are wavy.

Animal Inoculation.—1 cc. of an emulsion, made from a 24-hour growth on slant agar with sterile bouillon, injected subcutaneously over the abdomen, produced death in a guinea pig in 27 hours. At autopsy the organs were found generally congested and moist; the lungs, œdematous. Cultures made on slant agar from the heart's blood, lung, liver, spleen and kidney, in each tube, gave a pure culture of an organism, in all particulars, similar to the one described above.

Anærobic cultures, grown in air-tight jars deoxygenated with pyrogalic acid and sodium hydroxide, showed a growth quite similar to that obtained ærobically, save that it grew much slower and not so luxuriantly.

The fermentative power of this organism was tested in no other media than glucose agar. The activity of the fermentation there noted and the fact that it acidified and coagulated litmus milk, make it most probably belong to the "ærogenes" group of the capsulated bacilli, as described by Strong (4). Moreover, Perkins (10) has shown that all of the ærobic capsulated bacilli that have the power to break up sugars with gas formation may, by change of environment or passing through animals, be reverted to the "ærogenes" group as the prototype; that these organisms may, also, lose their fermentative power, in whole or in part, through modifications in environment.[1]

The clinical history, autopsy, and bacteriological findings in this case are extremely interesting in as much as a case of general infection and gas-cyst formation in man (5), an epizootic infection of the laboratory guinea pigs (6), both due to the *B. mucosus capsulatus*, and a study of the group of capsulated bacilli, in which organisms of the bacillus mucosus type were noted 56 times in 74 consecutive autopsies (11), have already been reported from this laboratory, and we are, still, repeatedly meeting with this organism as a primary and secondary invader in various kinds of lesions and conditions found at autopsies.

In the case here reported we apparently had first a general bacteriæmia and septicæmia, due to the *B. mucosus capsulatus;* subsequently, there was the formation of numerous minute abscesses in the liver. These minute abscesses increased in size till portions of their peripheries became coalescent, and thus formed the large multilocular, areolar abscess; this extended to the peritoneal surface of the liver, from which the infection spread to the general peritoneal cavity.

One of the series of cases of general septicæmia reported by Duval and Lewis (7) is important in this connection. A male patient, 37 years of age, born in Holland, and a cigarmaker by occupation, came into the hospital complaining of general malaise, loss of strength, and fever. He remained in the hospital 5 weeks, recovered completely, and returned to work well and strong. On the day after admission a blood culture was taken, under aseptic precautions, and plates yielded a pure culture of *B. capsulatus*. There were from 50 to 200 colonies per plate. One week after admission a second blood culture was taken. The cultures again were pure and showed the same organism. The number of colonies to the plate was larger than that obtained from the first cultures. A third blood culture was taken on the day of discharge. Again the cultures were pure and the number larger than that noted at any time before, equal and the same quantities of blood having been plated at each time. They note the apparent rarity of this organism as an agent of general infection and believe that the conclusions of this case have important bearings on immunity problems.

At the time the patient was discharged there were more bacteria circulating in his blood than when admitted to the hospital, as shown by bacteriological cultures; still he was to himself and others well and able to do work. Two weeks after his discharge the patient was seen at work and feeling perfectly well. These facts, they argue, indicate that, in addition to the acquired immunity to soluble toxins and the acquired bactericidal immunity, the human body has other mechanisms of protection against bacterial infection. The tissues in this case, they think, seems to have acquired a resistance to the toxic products of the infecting organism without there being developed substances harmful to the bacterial cell, the resulting condition becoming possible by the survival of the host and being a causal one between the animal body and the bacterium.

Perhaps this explanation, in a measure, offers a solution of the conditions of our case. Here the liver may be considered to have lost this power of resistance to the infecting organism and consequently suppuration and abscess formation has resulted.

[1] Only that portion of the autopsy and microscopical findings have been described here which bear directly on the case.

Why the liver or any organ should lose this power of resistance and become the focus of infection and the other organs remain free, while infectious organisms are continually circulating through them, has been a recognized but unsolved problem for years.

As to why the abscesses should, in the present case, be exclusively connected with the hepatic veins is also quite difficult to answer. There would appear to be no reason for or evidence of retrograde embolism. There were no thrombi in the heart or thoracic vessels; special care was taken to look for them.

This type of abscess is also rather interesting. It was first described by Charcot under the name "abscès aréolaire" (8) in connection with suppurative cholangitis and by Chauffard (9) in connection with suppuration in the portal system. It has also been described in connection with suppurative phlebitis of the hepatic veins. It is characterized by its infarct-like form and spongy structure. It may be formed by the fusion of numerous points of suppuration about the radicles of the portal or hepatic vein, or the branches of the hepatic bile ducts. A pyogenic membrane may form around its periphery and ultimately a well defined capsule may develop. It is said to be most commonly associated with infections of the appendix.

In conclusion we may safely say from the evidence here given, that—

1. *B. mucosus capulatus* may form multiple abscesses in the liver. These may be of the areolar type and result from a general infection with this organism, where the mode of infection and the point of inoculation is not apparent.

2. These abscesses may be all associated with the central hepatic veins of the liver lobule, for some reason and by some process that we are not able to determine.

I am greatly indebted to Dr. W. T. Howard for aid and assistance in the preparation of this report and also to Dr. David Marine, of the Western Reserve Medical School, for the accompanying microphotographs.

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THE INFLUENCE OF SEWERS AND GENERAL SANITATION UPON THE PREVALENCE OF TUBERCULOSIS.

By George M. Kober, M. D., Washington, D. C.

If it should appear to you from the title of my paper, that I am one of those who believe in the ubiquity of the tubercle bacillus and that the question of predisposition should receive first and foremost consideration, I desire it to be understood, that I am convinced from the splendid labors of Professor Carl Flügge and his associates, that the tubercle bacillus is not ubiquitous and hence the task of stamping out the primary sources of infection is by no means a hopeless one.

I believe, however, until this is accomplished that in this disease, as in other infectious diseases, due attention should be given to all the causes likely to influence their spread. In the course of my remarks I will have occasion to refer, therefore, to some of the more obscure factors concerned in the prevalence of tuberculosis, not because I consider them of paramount importance, but simply with a view of pointing out their relative influence, so that in our efforts to combat tuberculosis, they may receive proper consideration.

Sources of Infection.

The tubercle bacillus has been found in all tubercular deposits in man and animals, and the most frequent source of infection is conveyance from man to man, while the possibility of transmission from animals to man cannot be ignored.

The germs may enter the system by the respiratory and alimentary passages and by the skin and mucous membranes, if there is an abrasion. The tubercle bacilli have not yet been demonstrated in the soil, water or in the atmosphere, except in the immediate vicinity of a consumptive. Since the expired air of tuberculous patients does not contain the germs, we may assume that, when found in rooms, they originate largely from the material coughed up by persons and carelessly expectorated upon the floor, walls or carpets, which material after drying becomes a constituent of the household dust. Cornet demonstrated their presence in the dust of rooms and hospitals occupied by consumptives in 40 of the 147 samples examined. The investigations of Heymann, conducted under Professor Flügge, show that about 8 per cent of the dry dust collected in 120 private dwellings and wards occupied by consumptives contained tubercle bacilli. When collected with moist sponges, 15 per cent of the dust obtained from private rooms and 40 per cent of that collected in wards gave positive results by inoculation of guinea pigs. Wagner secured positive results in 8 per cent of his inoculations with dust collected in one of the German sanatoria.

In view of these facts, Professor Flügge believes that the danger from inhalation of infected dust has been overrated. Personally, I regret this statement, because the remarkable fact after all is, not that the tubercle bacilli were present in such a small percentage of the specimens examined, but that they should have been found at all, had proper precautions been taken in the collection and disposal of the sputa.

It has also been shown by the classical investigations con-

ducted under Professor Flügge, that about 80 per cent of consumptives may in coughing and talking project into the air little droplets infected with the bacilli, within a distance of 2 to 3 feet from the patient; and that these droplets constitute a very important source of danger, as they may be inhaled in a fresh and virulent state by persons in close proximity, especially if patients fail to guard against this mode of spreading, by the use of handkerchiefs held before their mouths. Flügge, without wishing to exaggerate the danger from droplet infection, believes it to be greater than from the inhalation of infected dust. He also emphasizes the sources of infection from fresh sputum on floors, causing contact infection, especially in children, and points out the dangers from infected handkerchiefs, clothing, towels, etc. It is perfectly conceivable that the germs may likewise be conveyed by small particles of sputum in kissing, in instrumental manipulations, or by adhering to eating and drinking utensils in common use. There is much reason to believe that the germs may be conveyed in clothing from carelessly expectorated sputum. Perlen tells us that of 4177 tuberculous subjects, treated in the Munich Poliklinik, 709 were engaged in tailoring, cleaning and shoe shops.

Tubercle bacilli have been found in the milk of tuberculous mothers and cows, especially when the lacteal glands were the seat of the disease or the system infected with general tuberculosis. Milk, cream, butter, ice cream and dairy products may contain tubercle bacilli if the product is derived from an infected cow.

The possibility that the germs of tuberculosis may be carried by means of flies and dust suggests that greater precaution be exercised in the exposure of food stuffs in show windows and markets.

As in other infectious diseases, the question as to whether the germs are introduced directly, and in sufficient numbers, is of importance. The observations of Humphrey, Pollock and Leudet conclusively show that in well-ventilated wards, of chest and consumption hospitals, the disease is not usually found to spread. In private practice the results are different. A French committee of investigation presents two hundred and thirteen cases of tuberculosis in which the communicability of the disease was clearly established. In sixty-four of these cases the disease was conveyed from husband to wife; in forty-three from the wife to the husband; in thirty-eight it was transmitted to brothers or sisters; in nineteen from parents to the children; in sixteen to distant relatives; and in thirty-two to outsiders. The communicability was most marked among the poorer classes. Another collective investigation by a German medical society revealed the fact that of nine hundred and thirty-eight married persons who died of acquired tuberculosis, in one hundred and one instances either the husband or the wife also contracted the disease. In 8.1 per cent of these cases the husband contracted the disease from his wife, and in 13.2 per cent the wife was infected by the husband. Other statistics might be adduced in favor of the communicability of the disease, but Zasetzky's observation is of special interest. He reports the case of a tuberculous woman who married, between 1872 and 1883, three husbands, all previously healthy; the first husband died in 1879 of tuberculosis, the second in 1881, and the third husband, at the time of the report in 1884, was also a victim of the disease, the wife in the meantime having died of consumption.

We can only explain the greater contagiousness in such instances by a more intimate contact, the occupation of the same room and bed, common use of eating and drinking utensils, mouth to mouth contact, the vitiated air of private rooms and greater danger from droplet infection. There is little or no evidence to show that the disease is ever inherited, but we may assume that in children of consumptive parents we are dealing with the transmission of vulnerable anatomical elements, and this, together with the fact that they are constantly exposed to the germs, renders them peculiarly liable to the disease.

Predisposing Causes.

From what has been said it is evident that while the tubercle bacilli are not ubiquitous they are at least widely scattered; the modes of invasion are also numerous, and yet there are a certain proportion of those exposed who do not contract the disease. This shows that in addition to the germ there must also be suitable soil for its growth and development. Such a soil is usually found in persons of feeble physique, victims of malnutrition, whose body has been weakened from any one or more of numerous causes, whether it be previous attack of sickness, loss of sleep, vice and dissipation, insanitary houses, lack of pure air, cleanliness, sunlight, outdoor exercise or proper food.

Clinical experience indicates that faulty nutrition, debility, loss of blood, anæmia, mental anxiety, diabetes, whooping cough, measles and other diseases favor the development of tuberculosis. We also know that a predisposition may be inherited, as evidenced by a delicate physique, narrow chest and general vulnerability of the tissues. A vulnerability of the tissues to the disease may also be acquired by indoor life and dust-producing occupations. One of the chief dangers of indoor life is exposure to vitiated air. The air of dwellings and workshops is never as pure as the outer air, because it is polluted by the products of respiration, combustion and decomposition, and the presence of individuals also tends to vitiate the air with dust, germs and organic matter from the skin, mouth, lungs and soiled clothing. Unless proper provision is made for the dispersion of foul air and the introduction of pure air there is much reason for assuming that these impurities play a more or less important rôle in what has been designated as "crowd poisoning," characterized in the acute form by symptoms of oppression, headache, dizziness and faintness, while the chronic effects of deficient oxygenation and purification of the blood are plainly evinced by the pallor, loss of appetite, anæmia and gradual loss of physical and mental vigor. All of these effects are intensified when human or animal beings are obliged to occupy rooms with an air supply insufficient for the proper oxygenation of the blood, and as a result of this habitual exposure to vitiated air, we note an undue prevalence of consumption in crowded dwell-

ings, workshops, prisons, public institutions, and formerly also in military barracks and battleships. Even live stock shows the baneful effects of insufficient air space, for tuberculosis among the range cattle of the far West, which are practically without shelter, is comparatively rare, while it affects from 15 to 25 per cent of dairy herds, which are housed, but without sufficient regard to light and air. Improved ventilation and increased air space has everywhere lessened the death rate, and it is chiefly by just such measures that the rate from consumption has been reduced from 11.9 to 1.2 per 1000 in the British armies. In like manner the undue prevalence of tuberculosis among the North American Indians and the negro to-day is largely a question of environment engendered by insanitary dwellings; the abrupt change from the native huts and tepees with their copious ventilation to congested and insanitary dwellings with deficient light and air space have doubtless established a peculiar vulnerability of the respiratory tract and lessened the general power of resistance. That the physical welfare of the negro responds promptly to improved environment is strikingly illustrated by a decrease in his general death rate in the city of Washington from 42.86 in 1875 to 27.92 per 1000 in 1907, and in the rate from consumption from 6.9 in 1878 to 4.5 per 1000 in 1908.

It has long been known that dust-inhaling occupations predispose to diseases of the respiratory passages, which may result in consumption. The particles of mineral dust produce an irritation of the mucous membrane of the nose, throat, respiratory organs and eyes, and the hard, sharp and angular particles of iron and stone dust may cause actual abrasions. According to Arnold, the dust which is inhaled lodges on the mucous membrane of the air passages and vesicles of the lungs, there to be coughed up, although some of the finest particles are taken up by the epithelial cells and white corpuscles and carried to the nearest lymphatic glands. The coarser particles, such as iron, stone or coal dust usually lodge upon the surface to be coughed up with the secretions. If not expectorated they will cause harm by clogging up the air vesicles and interfere with respiration. In the meantime not infrequently an irritation is set up, causing catarrhal conditions of the mucous membrane, or a more serious chronic inflammation of the respiratory organs, so common among persons engaged in dusty occupations. The chronic inflammatory conditions thus produced favor infection with the tubercle bacillus. At all events Hirt's statistics[1] show that men employed in dust-producing occupations suffer much more frequently from pneumonia and consumption than those not exposed to dust, and that there is practically no difference in frequency of disease of the digestive system. The relative frequency of these diseases per 100 workmen is as follows:

	Consumption.	Pneumonia.	Digestive disorders.
Workers in metallic dust	28.0	17.4	17.8
Workers in mineral dust	25.2	5.9	16.6
Workers in mixed dust	22.6	6.0	15.2
Workers in animal dust	20.8	7.7	20.2
Workers in vegetable dust	13.3	9.4	15.7
Workers in non-dusty trades....	11.1	4.6	16.0

[1] Cited by Harrington, Practical Hygiene, 1902, p. 678.

According to Sommerfeld, cited by Roth,[2] of 1000 deaths the number of deaths from consumption in occupations without development of dust was 381; in occupations with development of dust it was 480; in the Berlin population at the same ages it was 332.3.

Moritz and Roepke have shown that 72.5 per cent of the deaths among the metal grinders of Solingen are due to consumption, as compared with 35.5 per cent among the general population.

The death returns for 12 years of the city of Northampton, Mass., one of the centers of the cutlery and tool industry, show that among "grinders," "polishers" and "cutlers" diseases of the lungs were responsible for 72.73 per cent of the mortality, inclusive of 54.5 per cent of deaths from tuberculosis.

A collective investigation, published in 1901 and cited by Roth,[2] shows that of every 100 deaths among stonecutters, polishers and quarrymen, 86 were due to diseases of the lungs, inclusive of 55 deaths from consumption.

According to the reports of the census of 1900 the consumption death rate of marble-cutters and stonecutters in the United States is six times that of bankers, brokers and officials of companies, and the mortality in fifty-one other employments ranges between those extremes.

The amount of dust is perhaps less important than the character of the particles which compose it. The susceptibility to consumption in metal workers and stonecutters can only be explained by the fact that the hard, sharp and irregular particles of this kind of dust are more apt to produce injury of the mucous membranes of the respiratory tract. But it is not fair to assume that the less irritating dust is free from danger, for as pointed out by Roth, even the inhalation of plaster of paris or flour dust cannot be regarded with indifference, especially when it is preventable.

The Influence of Sewers in the Prevalence of Tuberculosis.

The records of the Health Office of the city of Washington show that during the past thirty years 14.5 per cent of all the deaths occuring in the District of Columbia have been caused by pulmonary tuberculosis. The death rate, however, has gradually and constantly fallen from 4.5 per 1000 in 1878 to 2.3 in 1907. The death rate from this disease in New York City has fallen in like manner from 4.27 per 1000 in 1881 to 2.42 in 1907. These reductions began long before the combat of the disease was a subject for popular education. The question naturally arises, if these reductions have resulted independent of any attempt to control the sources of infections, what are the chief factors concerned in bringing about this gratifying result? In considering the question, I know of no sanitary reforms which could have exerted a greater influence upon our general well-being than the introduction of sewers, improved water supplies and the erection of sanitary homes. It seems to me that the marked reduction in the prevalence of consumption after the introduction of sewers observed in England over forty years ago, and also in the cities of Washington

[2] Roth: Kompendium der Gewerbekrankheiten. Berlin, 1904, p. 106-108.

and New York, can only be attributed to the prevention of air pollution and of dampness. It has been estimated by Erismann that a cesspool with 18 cm. contents is capable of polluting the atmosphere in the course of twenty-four hours with 18.79 cm. of impure gas, composed of carbonic acid, ammonia, sulphuretted and carburetted hydrogen and volatile fatty acids. In view of this fact it requires no great stretch of the imagination to calculate the amount of air pollution which resulted from the 30,000 cesspools and other makeshifts prior to the introduction of the sewerage system in the city of Washington. In passing, I may remark that no two factors have contributed so much to the prolongation of human life as the improvement of the air we breathe and the water we drink.

In some cities the result has been a reduction of 50 per cent in the prevalence of tuberculosis, typhoid fever and diarrhœal diseases. The influence of impure air upon our physical well-being and the powers of resistance cannot be underrated. As a matter of fact, individuals who contract tuberculosis in cities often arrest the disease by removal to the country, showing that an abundance of pure air is a very important factor in the treatment of the disease, simply because it promotes oxygenation of the blood, stimulates the appetite and nutrition and thereby increases the general resisting power of the system. There can be no doubt as to the curative virtue of pure air, and hence we ought not to underrate its preventive properties. It is, of course, a difficult matter to explain how water is connected with the deaths other than those from waterborne diseases, yet when we consider that water enters into the composition of the body to the extent of over 60 per cent, we are in a position to appreciate the sanitary acumen of Aristotle when he wrote in his "Politica": "The greatest influence upon health is exerted by those things which we most freely and frequently require for our existence, and this is especially true of water and air."

The observations of Dr. Bowditch, of Boston, as early as 1862, clearly indicate that there is a relation between dampness of soil and pulmonary consumption, and Dr. George Buchanan, the medical officer of the privy council of Great Britain in 1867 supplied ample statistical proof that consumption became less frequent in certain towns after they had been sewered, and the soil consequently drained. In towns like Worthing, Rugby and Salisbury the deaths from consumption were reduced by 36 to 40 per cent. It is true that such a marked reduction did not always follow, but in these instances it may be fairly assumed that the soil was previously quite dry and could not be materially affected by increased drainage.

The importance of a dry, healthful building site was appreciated by Hippocrates, since he as well as Vitruvius, the father of architecture, referred in their writings to elevation as a desirable factor. One of the most striking illustrations of damp habitations as a predisposing cause to consumption has been recorded by Nowak, in the case of a prison in the vicinity of Vienna, containing on an average 200 inmates. Every convict is examined before his transport, and if found affected with incipient tuberculosis he is sent elsewhere. In spite of this precaution the deaths number about 50 per annum and the majority die from consumption. The prisoners are better fed in this institution than elsewhere, but the building rests on a wet, clayey soil, the walls reeking with moisture, and the rooms smell musty.

The relation of dampness to consumption may be explained as follows: Dampness of soil, unless special precautions have been taken, extends by capillary attraction to the walls and renders the entire house damp. Damp air abstracts an undue amount of animal heat, lowers the powers of resistance of the inmates and predisposes to catarrhal affections, and these in turn render the mucous membranes more vulnerable to the invasion of the tubercle bacilli. There is also reason for believing that the tubercle bacilli retain their vitality for a greater length of time in such an atmosphere on account of its humidity and excess of organic matter.

At all events it has long been known that tuberculosis is far more prevalent in damp, dark and insanitary houses. The children are anæmic and as puny as plants reared without the stimulating effects of sunlight. The death rate is often double and treble that of other localities. While there are doubtless other factors which determine the frightful mortality, none are more potent than dampness, deficient sunlight and ventilation. The tubercle bacillus clinging to floors and walls in carelessly expectorated sputum or droplets would be destroyed by a few hours exposure to sunlight, but finds in damp and dark basements, back-to-back houses, and yard-and-alley tenements suitable environments for its vitality and growth, and the other insanitary factors alluded to, together with the more intimate contact, materially increase the chances of infection.

Preventive Measures.

Time will not permit me to consider in detail the measures for the prevention for this disease, but I desire to emphasize a few which may be resorted to in the control of the sources of infection and the diminution of the predisposing causes.

1. Compulsory notification of cases to the health authorities as soon as the disease is recognized. This is of vital importance for the location and control of the source of infection and for the protection of the family and others. It has been urged that the depressing effect of such information would be too great for the patient, but this will surely be counterbalanced when we inform him that it is a curable and preventable disease, and that his chances for recovery are especially favorable if he does not reinfect himself.

The health authorities, apart from distributing proper printed directions, for the use of the family and the patient, as regard the care, disinfection of sputum and avoidance of droplet infection, should also resort to disinfection of the home and personal effects, especially upon the death of the patient or vacation of the premises.

2. The enactment and enforcement of laws against promiscuous expectoration (and coughing into the faces of persons where the sputum is liable to infect), and provisions for suitable spittoons and their proper disinfection in all public places is called for. The public should not cultivate an exaggerated fear of such cases, but has a right to insist upon clean and decent precautions.

3. The streets should be sprinkled and swept at night so as to reduce the inhalation of infected dust to a minimum.

4. The supervision of the sanitary conditions of hotels, theaters, churches, schools, ambulance service, sleeping cars, etc. should likewise be under the control of the Health Department, and house-cleaning should be accomplished, as far as practicable, by a dustless method.

5. Marriage with a tuberculous person should not only be discouraged, but absolutely prohibited by law. A tuberculous mother should not nurse her infant, and in the selection of a wet nurse a certificate of health should be demanded.

6. Isolation of tuberculous patients should be insisted upon in hospitals, asylums and public institutions. In private life the patient should at least occupy a separate bed, use separate eating and drinking utensils and neither receive nor give kisses.

7. Government inspection of dairies and of dairy and meat products and the extermination of bovine tuberculosis are clearly in the interest of public health. Until this is accomplished, or as an additional precaution, milk and cream, and even the cream used for butter and other dairy products, should be pasteurized, and all meats should be well-cooked.

Having considered the sources of infection and the indications for their control, it is well to refer to what may be done towards diminishing the predisposing causes to consumption. Many of these are questions of personal hygiene, connected with alimentation, clothing, baths, exercise, the alcohol and tobacco habit, vice diseases, etc., and I desire to emphasize here especially the duties of the State in preventive efforts.

When we recall the influence of sewers upon the prevalence of the disease and remember that only about 30 per cent of the population in the United States live in sewered towns, and about 41 per cent live in towns having public water supplies, we see at once the necessity that a system of public sewerage should go hand in hand with the public water supply. The neglect on the part of the State not only increases the dampness of the soil, but compels recourse to the various makeshifts for the collection and removal of excreta, and leads to pollution of the air, soil and water.

The influence of insanitary dwellings has been referred to and for reasons already given I consider the condemnation of houses unfit for human habitation, and substitution of sanitary homes, only second in importance to the destruction of the germs.

The State may not be in position to provide sanitary houses, but it can at least regulate and supervise the construction of all new houses with reference to the exclusion of dampness, sanitary plumbing, amount of air space, light, heating and ventilation of dwellings and clearly define what constitutes an insanitary tenement offered for rent, and provide a suitable remedy. The State should also interdict the erection of tall buildings, and of all buildings covering over 66 per cent of the lot, since they shut out light and air, thus destroying the very object for which broad streets and avenues were created, and bringing us back to the insanitary era of the medieval towns with their narrow and winding streets.

The State should pay attention to the physical development of its youth, and this is best accomplished by proper training, preferably in the open air, in connection with the public schools and playgrounds. The children of consumptives require special attention, because of the transmission of vulnerable anatomical elements which render them peculiarly liable to the disease; this predisposition may certainly be overcome, in addition to proper food, by pure air, methodical gymnastics and systematic hardening of the skin secured by bathing, and no school should be without these hygienic advantages. If it be found that school children are starving for want of food it is clearly our duty to make suitable provisions to prevent permanent dependency. In choosing a subsequent vocation for predisposed subjects it is important to avoid occupations involving sedentary habits and indoor dusty work. No effort should be spared to increase the resisting power of the individual, but as pointed out by Professor Flügge, all such efforts should not overshadow the real sources of infection.

There is abundant statistical material to indicate the influence of dust-producing occupations as a predisposing factor to tuberculosis and other pulmonary diseases, and it is clearly the duty of the State to formulate efficient laws in regard to factory sanitation and the occupations in general which are injurious to health.

It is certainly the duty of the State to see that every patient who has no home, or whose environment offers less favorable conditions for his recovery, is provided with proper care and shelter. It may be truly said, that hospital treatment of consumptives offers the best chances for recovery and the ultimate extermination of the disease, and the State, until a comprehensive system of industrial insurance has been adopted, must shoulder the responsibility in the case of patients unable to bear the financial burdens. Every city of any size should provide facilities for the isolation and proper treatment of patients, supplemented by general State sanatoria. Since the identification of the disease is the first and most important step in its treatment and prevention, the establishment of dispensaries for the recognition of incipient cases among the dependent classes seems urgently called for. Such dispensaries should become the feeders for municipal and State sanatoria, and when properly conducted, with special reference to social service, will be a most important factor in the combat against tuberculosis.

It is clearly the duty of the State to prevent destitution of the family while the bread-winner is incapacitated for work; the State should likewise suppress quackery, for no class falls more readily a prey to unscrupulous mountebanks than our consumptives.

The federal government is already performing an important duty by exercising a watchful care over the subject of tuberculosis among animals. The preventive measures urged by the Bureau of Animal Industry are of far-reaching significance, although primarily intended to protect the pocket-books of our farmers and stock-raisers. Large sums are annually, and very properly, expended to quarantine our seaports against cholera, yellow fever and small-pox, because these diseases, if permitted to gain a foothold, occur in epidemics, are rapidly fatal, and hence strike terror into a community. It is to be hoped that similar opportunities will be afforded to the Public Health Service to cope with tuberculosis, which claims more victims than all these diseases combined.

EDWARD L. TRUDEAU, M. D.

In commemoration of the sixtieth birthday of this distinguished physician, the following sonnet and reprints, prefaced by a title-page and dedication, were presented to him by his pupils:

STUDIES IN TUBERCULOSIS
BY THE PUPILS OF
DR. EDWARD L. TRUDEAU

COLLECTED IN COMMEMORATION OF
HIS SIXTIETH BIRTHDAY
OCTOBER 5, 1908

IN THE ADIRONDACKS
SARANAC LAKE
NEW YORK

To

EDWARD LIVINGSTON TRUDEAU

Doctor of Medicine
Master of Science
Founder of the Adirondack Cottage Sanitarium
and of the
Saranac Laboratory for the Study of Tuberculosis
Upon the Occasion of his Sixtieth Birthday
October 5, 1908,

THIS COLLECTION OF THE WRITINGS
OF HIS GRATEFUL PUPILS
IS AFFECTIONATELY DEDICATED

ONE PHYSICIAN,
E. L. T.

By Charlotte Stuart Best

Of infinite compassion, vision keen,
Great mind and greater heart;—of purpose high
That lifts his work to heights of majesty,
Above all motives commonplace or mean:—
His life is pledged to combat. As of old
Fought Arthur and his knights against the sway
Of murderous hordes, he strives to keep at bay
A foe more deadly, pitiless and bold,
That spoils our land and no condition spares;
The changing seasons mark his changeless aim;
Highest and lowest alike acclaim
Their champion, as steadfastly he fares,
Unresting, selfregardless, on his quest,
By all who know him, loved, revered and blessed.

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The Early Diagnosis of Pulmonary Tuberculosis

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The Diagnosis of Early Pulmonary Tuberculosis

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The Sanatorium

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The Ultimate Test of the Sanitarium Treatment of Pulmonary Tuberculosis and its Application to Results obtained in the Adirondack Cottage Sanitarium

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3d An. Report Natl. Assn. *63*
Further Notes on the Technique of the Tuberculo-Opsonic Test

HANCE, Irwin H. *Med. Rec.*, December 28, 1895 *3*
A Study of the Infectiousness of the Dust in the Adirondack Cottage Sanitarium

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A Further Study of Tuberculous Infection of Dust

KINGHORN, H. McL. *Montreal Med. Jr.*, July, 1899 *10*
The results of Sanitaria and Special Hospital Treatment in Pulmonary Tuberculosis

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KINGHORN, H. M. *Jr. Med. Research*, 1902, viii *22*
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KINGHORN, H. M., E. L. Trudeau and E. R. Baldwin
Studies from the Saranac Lab'y *35*
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KINGHORN, H. M *Studies from the Saranac Laboratory*, 1900-1904, pp. 45-46 *39*
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KINGHORN, H. M. *Studies from the Saranac Laboratory*, 1900-1904, pp. 81-2 *43*
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KINGHORN, H. M., E. R. Baldwin and A. H. Allen
Med. News, Sept. 30, 1905 *46*
Studies on Immunity in Tuberculosis: The Properties of the Serum of Immunized Rabbits

KINGHORN, H. M. *Med. News*, September 30, 1905 *47*
The Serum Diagnosis of Tuberculosis

KINGHORN, H. M. and D. C. Twichell
Am. Jr. Med. Sc., August, 1906 *53*
The Technique of the Tuberculo-Opsonic Test

KINGHORN, H. M. and D. C. Twichell
Am. Jr. Med. Se., October, 1906 *54*
Further Notes on the Serum Diagnosis of Tuberculosis

KINGHORN, H. M. *Montreal Med. Jr.*, 1907, xxxvi, 735 *59*
The Hygienic and Dietetic Treatment of Pulmonary Tuberculosis

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Further Notes on the Technique of the Tuberculo-Opsonic Test

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Preliminary Communication on the Bio-Chemistry of the Bacillus Tuberculosis

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Jr. Med. Research, 1901, vi, 120 *17*
The Action of Proteolytic Enzymes on Bacterial Toxines

LEVENE, P. A. *Jr. Med. Research*, 1901, vi, 135 *18*
Bio-Chemical Studies on the Bacillus Tuberculosis

LEVENE, P. A. *Med. News*, January 4, 1902 *21*
On the Absorption of Alexins by Tubercle Bacilli

LEVENE, P. A. *Studies from the Saranac Laboratory*, 1900-1904, pp. 23-26 *36*
On the Production of Hemolytic Serum by Injecting Animals with Different Constituents of Erythrocytes

LEVENE, P. A. *Studies from the Saranac Laboratory*, 1900-1904, pp. 27-35 *37*
On the Biological Relationship between Proteids

Levene, P. A. and E. R. Baldwin
Studies, Saranac Laboratory, 1900-04, pp. 37-44 38
On the Anti-Hemolytic Action of Some Cell and Tissue Constituents

Levene, P. A. *Studies from the Saranac Laboratory*, 1900-04, pp. 83-90 44
On the Bio-Chemistry of Bacillus Tuberculosis

Lupton, E. J. S., Lawrason Brown and A. H. Allen
Am. Jr. Med. Sc., Feb., 1907 56
A Brief Study of a Diphtheria Epidemic at the Adirondack Cottage Sanitarium (for Incipient Pulmonary Tuberculosis)

Nichols, Joseph L. *Med. News*, September 30, 1905 48
Studies on Immunity in Tuberculosis: A Histological Study of the Lesions of Immunized Rabbits

Pope, E. G. and Lawrason Brown
Am. Jr. Med. Sc., October, 1904 31
The Shape of the Chest in Health and in Pulmonary Tuberculosis

Pope, E. G. and Lawrason Brown *Am. Med.*, 1904, viii, 879 32
The Postdischarge Mortality among Patients of the Adirondack Cottage Sanitarium

Pope, E. G. and Lawrason Brown *Zeit. f. Tub.*, 1908, xii, 70
The Ultimate Test of the Sanitarium Treatment of Pulmonary Tuberculosis and its Application to the Results obtained in the Adirondack Cottage Sanitarium

Price, J. W. and E. R. Baldwin
Trans. 2d An. Meeting Nat'l Assn., May 16-18, '06 51
Studies on Immunity in Tuberculosis. III. Experiments with Leucocytes, Lymph Glands and Bone Marrow Extracts of Immunized Animals

Price, J. W. and E. R. Baldwin *Centralb. f. Bakt., Parasit. u. Infektions-Krankheiten I Abteilung Referat.*, 1906, xxxviii, No. 24-25 55
Die "Aggressine" der Tuberkelbacillen

Twichell, David C. *Med. News*, September 30, 1905 49
The Vitality of Tubercle Bacilli in Sputum

Twichell, D. C. and H. M. Kinghorn
Am. Jr. Med. Sc., August, 1906 53
The Technique of the Tuberculo-Opsonic Test

Twichell, D. C. and H. M. Kinghorn
Am. Jr. Med. Sc., October, 1906 54
Further Notes on the Serum Diagnosis of Tuberculosis

Twichell, D. C., H. M. Kinghorn and N. M. Carter
3d An. Rep. of Natl. Assn. 63
Further Notes on the Technique of the Tuberculo-Opsonic Test

Wilder, J. A. and E. R. Baldwin *Am. Jr. Med. Sc.*, June, 1899 9
A Case of Lymphatic Leukaemia Combined with Pulmonary Tuberculosis

TUBERCULOSIS—A PLAN OF STUDY.

By W. L. Moss, M. D.,
Instructor in Medicine, the Johns Hopkins University.

The accompanying syllabus indicates the plan of study proposed for the Phipps Dispensary Staff 1908-1909. Meetings are to be held twice each month. At each meeting a definite number of the subjects from the accompanying outline will be taken up for study. References bearing on the subjects will be given out in advance of the meetings, and as a rule five men will be asked to report on the references. Ten minutes will be allowed each man in which to make his report. At the conclusion of the reports half an hour will be given to discussion. Each man will be limited to three minutes in the discussion.

Each reporter will please bring a written abstract of the articles he reports, on 4 x 6 cards, *with the title of the paper, the reference and his own name at the top.*

It is desired that the abstract contain briefly the conclusions of the author and indicate the experimental work or other basis on which the conclusions are reached.

The cards will be kept on file in the Dispensary Library and will be accessible to any of the members who wish to use them.

Please keep the syllabus for reference throughout the year so that all the members may be prepared to take part in the discussion at each meeting.

The above plan of study has now been in operation for several months with very satisfactory results.

Previously the members of the Phipps Dispensary Staff had formed a Journal Club, in which each man was assigned two or three journals which he was to follow, and from which he was to report any interesting or valuable contributions on the subject of tuberculosis. It often happened that the articles reported at a meeting were on widely differing and sometimes highly specialized phases of the tuberculosis problem, difficult to convey in brief abstract form to those who had not previously some acquaintance with the particular phase of the subject under consideration.

By introducing a systematic plan of study, as indicated above, and having a definite subject assigned in advance for each meeting, all of the members could direct their reading so as to have at least some familiarity with the subject and be prepared to discuss the papers intelligently.

A card index has been prepared of the subjects indicated in the syllabus. The first card is headed:

1. Tubercle bacilli and others of the same group.

(a) Human.

The second card is headed:

1. Tubercle bacilli and others of the same group.

(b) Bovine.

And thus throughout the entire syllabus, a card in the index is devoted to each subhead. Then all of the recent numbers of the *Index Medicus* were gone over and references bearing on the various subjects obtained. These references were transferred to appropriate cards in the card index.

PROVISIONAL PLAN OF STUDY FOR THE PHIPPS DISPENSARY STAFF OF THE JOHNS HOPKINS HOSPITAL, 1908-1909.

I. Tubercle Bacilli and Others of the Same Group.

(1) Characteristics.
- Morphological.
- Tinctorial.
- Cultural.
- Chemical.
- Biological
  - Growth.
  - Reproduction.
  - Viability.
  - Pathogenicity
    - Virulence.
    - Attenuation.

(a) Human.
(b) Bovine.
(c) Avian.
(d) Piscine.
(e) Other acid fast bacilli
- Smegma.
- Hay.
- Butter.
- Leprosy.

II. Portals of Entry.

(a) Respiratory tract.
(b) Alimentary tract.
(c) Genito-urinary tract.
(d) Hereditary transmission.
(e) Other portals of entry: Skin, eye, ear, etc.

III. Immunity.

Forms of (A) in non-susceptible animals.
(B) in susceptible animals.
(a) Active.
(1) Agglutinin.
(2) Precipitin.
(3) Bacteriolysin.
(4) Phagocytic—opsonin.
(5) Antitoxic—tuberculin.
(b) Passive sera { Marmorek. Maragliano. Transfusions.

IV. Diagnosis.

(1) Physical signs.
(2) Bacteriological { Sputum. Urine. Feces. Fluids { Spinal. Serous cavities.
(3) Cytological: Blood, spinal fluid.
(4) Chemical: Calcium metabolism, etc.
(5) X-ray.
(6) Biological.
(a) Tuberculin { Conjunctival—Wolf-Eisner, Calmette. Cutaneous—v. Pirquet, Moro, Detre.
(b) Opsonin. { Subcutaneous.
(c) Agglutination: Arloing and Courmont.
(d) Bactericidal.
(e) Precipitation.
(f) Fixation of complement.
(g) Hemolysin.

V. Therapy.

(1) Hygienic.
(a) Fresh air { Sunshine. Cold. Altitude. Currents of air.
(b) Diatetic.
(2) Drugs.
(3) Tuberculins. All the various kinds including bovine.
(4) Vaccines.
(a) Dead, human and bovine.
(b) Living, human and bovine.
(c) Mixed tubercle bacilli and other bacteria.
(5) Sera.
(a) Marmorek.
(b) Maragliano.
(c) Transfusions.
(6) Radio-therapy.
(a) Historical: Colored lights.
(b) X-ray.
(c) Finsin light.
(d) Radium.
(7) Hyperæmia: Bier and others.
(8) Pneumothorax, artificial.
(9) Exercise.

VI. Relation of Human Tuberculosis and Tuberculosis in Other Animals.

(1) Relation of bovine to human tuberculosis.
(a) Clinical evidences (circumstantial) that humans can be infected by tuberculous bovines.
(b) Pathological statistics (circumstantial) evidence of primary alimentary infection.
(c) Incidence of tuberculosis in dairy cattle and of tubercle bacilli in their milk.
(d) Exact bacteriological determination of the variety of tubercle bacillus present in cases of human tuberculosis. (British Commission, German Commission. Theobald Smith, Ravenel, Bureau of Animal Industry and others.)
(2) Human tuberculosis as an etiological factor in animal tuberculosis.

VII. Sociological Aspects of Tuberculosis.

(1) Incidence.
(2) Mortality.
(3) Economic losses: Human and animal tuberculosis.
(4) Prophylaxis.
(a) Educational.
(b) Legal.
(c) Sanitaria.

In advance of each meeting a certain number of the references are given out and after the meetings, written abstracts of the articles reported on are handed in and filed under the corresponding heading in the index.

All of the members of the staff have been requested to remember the index in their reading and to record any valuable references whether they have been presented at the regular meetings or not. In this way we feel that we are building up a valuable reference index on the subject of tuberculosis.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

December 7, 1908.

Dr. Frank R. Smith, the president, in the chair.

1. **The Tonsil as a Factor in the Cause of Disease.** Dr. J. Bordley.

Dr. Bordley considered the tonsil as an active factor in the struggle for existence. The healthy tonsil in its maximum growth at puberty is a fence against invasion. When diseased, however, it is often the portal of entry for organisms. He theorized that the tonsil prevented actual bacterial invasion of the body from the mouth, but allowed the absorption of toxin from its crypts into the general circulation.

Bacteria enter the tonsil of a child 12 hours after delivery and there produce toxins. In 200 cases of atrophic tonsils, 196 contained organisms which were proven virulent for laboratory animals. *Streptococcus pyogenes* was demonstrated in 101 of these cases. These tonsils in situ were small and hidden, and contained cheesy material in their crypts.

The symptoms in these 200 cases included wide, sluggish

pupils, periodic exophthalmus, failing hearing, coated tongue, enlarged lymphatic glands, palpitation and irregular heart; nervous dyspepsia, anorexia, diarrhœa, constipation and pallor. The patients were under normal weight. Neurasthenia, fainting attacks, tetany, scotoma and hemicrania occurred. The temperature in the morning was subnormal; in the evening, above normal. The average count of red blood corpuscles was 4,200,000; the leucocytes, 8000 to 14,000. The polymorphonuclear neutrophiles and eosinophiles were increased relatively at the expense of the small mononuclear elements. The urine was normal. The duration varied from four months to several years. Eighty-five per cent were in women.

The pathology of the tonsil was an atrophy of the general structure plus wide crypts filled with cheesy material. Cystic spaces were common. The covering was of thin, superficial epithelium. Giant cells were seen in two cases and tuberculous caseation in four.

His treatment was removal by blunt extracapsular dissection. The patients were kept in the hospital five days, using simply a gargle. The loss of blood was slight in every instance. The weight curve was interesting. A loss of 5 lbs. in the first few days was followed by an average gain of 15 lbs. in three months. No case gained less than 3 lbs. The greatest increase was 60 lbs.

In summarizing, he stated that these patients were young adults who were not well. They had no definite disease, but were weak and anemic. The tonsils had lost their resisting power and become an incubator for bacteria from which an unlimited supply of toxin was being absorbed.

He added that he had injected lymphatic ducts leading from the tonsils to the thyroid gland, which suggested to him a cause for the presence of exopthalmic symptoms in many cases.

Discussion.

Dr. J. M. West was gratified with the scientific paper, which showed so clearly the relation of the tonsils to internal disease. He agreed with Boswell, who 30 years ago maintained that any visible tonsil was a pathological condition. Time was wasted in trying to find a physiological function for a pathological lesion. He preferred dissection with a sharp knife, controlling hæmorrhage when necessary with the clamps of the general surgeon.

II. A Case of Mikulicz's Disease. Dr. R. L. Randolph.

Dr. Randolph showed a young colored woman in whom the symmetrical enlargement of the lachrymal glands had interfered with closure of the lids. This swelling had subsided in four months and was followed after this interval by enlargement of both parotid glands. The condition resembled an extreme grade of mumps. However, there was no sign of acute inflammation in either the lachrymal or parotid swellings. The spleen was not palpable; the blood was negative; and there was no history of syphilis. The case was extraordinary in that the parotid swelling arose as the lachrymal subsided.

Mikulicz first described the disease in 1892 as a symmetrical enlargement of the lachrymal, salivary and occasionally buccal glands. The usual combination is of lachrymal and parotid glands, as in this case. The condition is rare, only 35 cases being recorded and those mostly by surgeons.

Discussion.

Dr. T. B. Futcher spoke of Dr. Osler's case, reported in the American Journal of Medical Sciences for 1898. A girl of 14, also colored, showed a symmetrical enlargement of the lachrymal, parotid and submaxillary glands. The spleen was palpable. She gave a history of congenital syphilis, and the condition improved under antiluetic treatment.

III. A Study of Leprosy with Especial Reference to its Occurrence in the Bahama Islands. Dr. C. A. Penrose.

Dr. Penrose gave a description of the Baltimore expedition to the Bahama Islands, illustrating his talk with lantern slides.

December 21, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Frank R. Smith, the president, in the chair.

I. Exhibition of Surgical Cases. Dr. J. W. Churchman.

Typhoid Cholecystitis.—Dr. Churchman reported a woman of 38 who had had pneumonia six weeks before admission. Both lower lobes were involved. No history of typhoid fever at any time could be elicited.

Five days before admission she had an attack of abdominal cramps with nausea and vomiting. There was no jaundice. The liver was enlarged and the gall bladder palpable. At operation a large empyema of the gall bladder was drained. No stones were found. Cultures from the pus yielded *B. typhosus* in pure culture. A Widal reaction done at this time was positive.

The case was interesting in that no history of any previous illness other than the pneumonia was obtained. The pneumonia had a sharp onset with pain in the side, cough and bloody expectoration. It apparently resolved by lysis, as there was some bronchitis still present on admission. Perhaps the pneumonia was a complication of an attack of typhoid fever.

Appendicitis in Children.—Reported in full in the January, 1909, number of this journal.

Subphrenic Abscess following Appendicitis.—This patient, a man of 37, was operated upon in Greensboro, N. C., nine days after an attack of acute appendicitis. The appendix was not found, but an abscess was drained. This was three months before admission. During the last month he had noticed pain in the left iliac fossa and the presence of a lump, which was hard and tender. Some occasional pain had occurred in the right iliac fossa also.

On admission an appendectomy was done through the right rectus, and the mass on the left explored. It was found to be an œdematous, adherent omentum. No pus was found. He did very poorly after operation, and had great discomfort,

inability to sleep, loss of appetite and fever. An ophthalmo-tuberculin test was negative.

A few days later an abscess appeared extraperitoneally on the left: it was opened and drained. The pus was yellowish and suggested actinomycosis, but no rays or filaments could be demonstrated. Following this the border of the liver descended 3 cm. below the costal margin in the right mammary link. Impaired resonance and diminished breath sounds were made out at the base of the right lung behind. There was a paravertebral triangle of dulness on the left. These signs, the septic temperature, and a leucocytosis of 25,000, gave a probable diagnosis of subphrenic abscess. This was confirmed by exploratory puncture; portions of the 10th and 11th ribs were excised; and the abscess cavity was drained. His convalescence from now on was uninterrupted.

Dr. Churchman cited the classification of subphrenic abscesses, made by Barnard, of the University of London. He reported 76 cases.

On analysis, this case had its origin in an acute appendicitis with abscess, which crept retroperitoneally to the left and also spread insidiously upward, causing the subphrenic abscess of the right extraperitoneal type.

Luetic Bursitis.—This patient complained of a bilateral house-maid's knee. Beside the prepatellar bursæ, both bursæ over the olecranous were involved. There was a history of urethritis, and definite tertiary syphilitic lesions were found. Through antiluetic treatment the swelling of all the bursæ disappeared. The features emphasized were the symmetrical involvement, without pain, and the relief by anti-syphilitic measures.

He also described another case typical of the second form, namely, the gummatous bursitis.

II. Exhibition of a Case of Alopecia Universalis. Dr. L. F. Barker.

Dr. Barker exhibited a Norwegian sailor, 38 years old, who was suffering from diabetes mellitus. A year and a half previously he had noticed a sudden increase in appetite, excessive thirst, and increased amount and frequency of urination. This had followed a period of a few months in which he had suffered domestic and financial worries.

A year later, coincident with a rapid loss of weight, twenty pounds in one month, his hair began to fall out.

The feature of the physical findings was the absence of the hair over the entire body. One hair was found upon the head, a few in the axillæ (hirsæ) and on the legs (lanugæ), and about sixty upon the pubes (pubæ). There were no eyebrows or lashes (supercilii), nor any hair in the nares (vibrissæ), in the ears (tragæ), or on the face (barbæ). The hair found was fine, of normal size and uniform calibre, showed no nodes, and contained no air. The sweat glands were not changed. The skin of the scalp was tense, smooth, and glistening.

The fact that a slight papular eruption with bran-like scales appeared before the hair fell out was evidence of a seborrhœa sicca with eczema following. The alopecia may have been due to the seborrhœa.

Dr. Barker considered the question as to whether he was dealing with a trophic disturbance of diabetes or a mere accidental occurrence. The loss of hair in diabetes has been described by Dr. Gilchrist. It amounts to a thinning of the hair, as a rule.

Dr. Prince Morrow reported one case of complete alopecia in diabetes and several incomplete cases. But in the literature the cases have universally followed a neural or psychic trauma, as injury to the skull, a stroke of lightning, or fright. This is probably the second case in the literature of alopecia universalis in a diabetic subject. Dr. Barker feels there is some connection between the two—that it is not an accidental occurrence.

III. A New System of Open Air Construction for Hospitals and Tenement Houses. Dr. Sarason, Berlin, Germany.

Dr. Sarason discussed his plans for the construction of dwelling houses, tenements, sanatoria, and hospitals, which enable a maximum of open air and uncovered porch to the occupants. Diminishing the width of each higher floor so that the veranda of the floor below is not roofed over, thus constructing the building on the plan of terraces one above another, the beds on every floor can be wheeled out into the open air with the open sky above them—the object which he considers very important. The paper was illustrated by plans and photographs upon the epidioscope.

NOTES ON NEW BOOKS.

The Skin Affections of Childhood, with special reference to those of more common occurrence, and their diagnosis and treatment. By H. G. Adamson, M. D., London, M. R. C. P., etc. (*London: Henry Frowde and Hodder & Stoughton, 1907.*) *Oxford Medical Publications.*

The principal value of this short manual on the Skin Affections in Childhood, by Dr. H. G. Adamson, is that the book is based very largely upon his own extensive personal experience. There is good reason to present thus separately the diseases of the skin as occurring in infancy and childhood, as many of the more common skin affections are limited to an early period of life, and others occurring at all ages exhibit in infancy peculiar manifestations. The author makes no pretense to discuss exhaustively either the etiology of many of the affections nor to describe minutely their pathology. In nearly all instances, however, he does very satisfactorily discuss the objective lesions seen in childhood, and suggests the line of treatment which he himself has found most serviceable. Concerning several of the diseases, such as eczema and urticaria, partly induced by intestinal disturbances, but little is said as to the exact method in which the diet should be altered for infants or older children in the cure of these affections.

The author recognizes the importance of classifying the diseases of the skin as far as possible on an etiological basis and has divided the affections into three main groups: First, those dependent upon direct physical causes; second, those due to local

parasitic action: (a) animal, (b) mould fungi, (c) microbic; and third, affections due to toxæmia and general microbic infections. To these, for the sake of convenience, he has added three additional groups, one on congenital affections, one on affections of nervous origin, and a final one, including those diseases whose etiology is unknown.

Perhaps a little too much space is given to the conditions which are very rare in children, but in the main emphasis has been laid on the more common skin affections. Particularly satisfactory is the writer's discussion of impetigo, tuberculosis of the skin, lichen urticatus, the latter a very frequent affection which is often unrecognized.

The value of the X-ray treatment in ring-worm and certain other diseases is dwelt upon and the method of limiting the ray to the affected part is satisfactorily described. At the end of the book are a number of formulæ found valuable by the author in the treatment of many skin lesions.

Altogether the little manual seems to have fulfilled the purpose of the writer which was to furnish a practical guide to the clinical study and treatment of the skin affections in children, and can be particularly recommended as a help to those whose interest lies largely in pediatrics. J. H. M. K., Jr.

Pathogenic Micro-organisms, Including Bacteria and Protozoa. By William Hallock Park, M. D., assisted by Anna W. Williams, M. D. Third edition, enlarged and revised. 642 pp. (*New York and Philadelphia: Lee & Febiger, 1908.*)

We have had occasion to comment favorably upon previous editions of Park's Bacteriology and take pleasure in again referring to this excellent text-book. The present 1908 edition has been considerably enlarged, such subjects as opsones and the bacteriology of the normal intestine receiving more adequate presentation. The author is conservative in his opinion as to the accuracy of the opsonic index, but in general is lead to believe in the efficacy of the vaccine treatment of infections. The recent important work of Tissier and his followers upon some of the anærobic and the acid-resisting bacteria of the intestines is carefully reviewed and in the chapter on the typhoid bacillus the importance of the chronic bacillus carrier is properly emphasized. In the section dealing with meningitis and the meningococcus, Dr. Park does not express a particularly favorable opinion of the serum treatment of meningitis, in view of the recent statistics reported by Flexner and Jobling. As in the previous editions, the chapters on diphtheria and tuberculosis are the most valuable sections to be found in any text-books on this subject, while that portion of the book dealing with protozoa, written by Miss Williams, remains the most authoritative publication dealing with this group of micro-organisms.

A Manual of Obstetrical Technique, as Applied to Private Practice, with a Chapter on Abortion, Premature Labor and Curettage. By Joseph Brown Cooke, M. D., etc. Illustrated. Sixth edition, enlarged and fully revised. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

No book without value ever reaches a sixth edition, and those who have used this manual will be glad to note its continued success. It really requires no recommendation. For the general practitioner it is an admirable little volume, clearly written and with emphasis laid on the important points. If a doctor follows closely the author's directions, he will have no reason to regret them.

A Manual of Diseases of Children. By John Ruhräh, M. D. Second edition, thoroughly revised. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

A second edition of A Manual of Diseases of Infants and Children, by Dr. John Ruhräh, indicates that the book met with a favorable reception from both practitioners and students. It certainly does in a more satisfactory manner than any manual with which we are familiar present succinctly the various affections of infancy and childhood. The section on infant feeding occupies a large space proportionately and is for the most part taken from Holt's Text-Book. It is probable that in a subsequent edition less space will be given to the several tables suggesting the amount and percentages fed to infants of various ages and that more weight will be laid on the calorific need of the patient.

The necessarily brief descriptions and rather abrupt style are to a certain extent compensated for by a reference to the original articles concerning many of the diseases treated. It is doubtful, however, whether the ordinary medical student will not be content with the somewhat didactic descriptions of the manual.

J. H. M. K., Jr.

A Handbook of Suggestive Therapeutics, Applied Hypnotism, Psychic Science. By Henry S. Munro, M. D. Second edition. (*St. Louis: C. V. Mosby Medical Book and Publishing Company, 1908.*)

This is a book of 360 pages, the greater part of which is given over to "detailed explanation of how to apply suggestion efficaciously, both with and without hypnotism as a therapeutic adjunct," in which explanation numerous brief case reports form a part. There is considerable discussion of a philosophic, socialistic or other nature which at times rather serves to obscure than to render the subject clearer.

That the book is in its second edition is proof that it has achieved some popularity and this is not surprising for there is much good sense displayed, and the author's ideas are as a rule correct. The manner of presentation does not appeal to the reviewer, who much prefers the work of Dubois, despite the fact that his cases are described in "high-sounding, neurological phraseology." The author's style might be less offensive if the book were not printed in so eccentric a manner, as indiscriminately black-faced type is used to accentuate something which as a rule it were better not. Naturally this has the effect of weakening the parts it were desirable to emphasize. On the whole the book can hardly be commended. W. R. D.

The Principles and Practice of Gynecology. For Students and Practitioners. By E. C. Dudley, A. M., M. D., Professor of Gynecology, Northwestern University Medical School, Chicago, Ill., etc. Fifth edition, revised and enlarged. 806 pages, with 431 illustrations and 20 full-page plates in colors and monochrome. (*Philadelphia and New York: Lee & Febiger, 1908.*)

The writer states in the preface to this the fifth edition of his work, that, as in the previous editions, he has divided the subjects, not in the usual manner of grouping in each part all the divers diseases of some special organ, but so far as practicable he has arranged them according to their pathological and etiological sequence.

He has thoroughly revised the text and has included the recent advances in gynecology, and has so condensed and rewritten the book that the new matter has been added without materially enlarging the volume. The following chapters have been subjected to special changes: Treatment of Salpingitis; Ovaritis, and Pelvic Peritonitis; Treatment of Myoma Uteri; Treatment of Carcinoma Uteri; Treatment of Descent of Uterus; and Treatment of Retroversion and Retroflexion. Two new chapters have been added to the book, one an introductory chapter on the Defense of Gynecology as a Specialty, and the other on Incontinence of Urine in Women.

To those who are familiar with the previous editions of the work, a further review of the present one is not necessary. To

those who are not familiar with this book, the following excellent features may be mentioned:

1. The treatment of the subject by considering general pathological processes as traumatisms, infections, tumors, etc., under these heads and not as special diseases of each organ, thus presenting a clearer picture of these pathological processes and their natural course.

2. The special attention to plastic work and minor gynecological operations, a department of gynecology to which the author has made many valuable contributions and one which is often slighted in works on the subject.

3. As the fifth edition it represents not only a thorough revision of previous ones, but also includes the most recent advances in gynecology.

4. In this work the author has described the methods of diagnosis and treatment which in his experience have proven most valuable.

To the student and practitioner, for whom this book is written, it should prove, as it has in the past, one of the most valuable treatises on the principles and practice of gynecology.

J. A. S.

Economic Zoology. An Introductory Text-Book in Zoology, with Special Reference to its Applications in Agriculture, Commerce and Medicine. By Herbert Osborn, M. Sc., Professor of Zoology in the Ohio State University. Price, $2.00. (*New York: The Macmillan Company, 1908.*)

This book should be in the hands of every physician because of its close bearing upon the practice of medicine. If the facts of Zoology were clearly known to those who investigate disease, fewer idle theories would be formulated and closer attention would be given to the etiology of disease. An enumeration of a few of the practical medical topics here presented will suffice to show the great value of the book. The author treats of protozoa and their relations to malaria, of trypanosoma as a cause of sleeping sickness, of the cattle tick as a cause of Texas fever, of the flea and other similar disease carriers. The accounts given of the various species described are clear and definite and their usefulness is much increased by excellent illustrations. The volume also deserves a place in the library of every family and has a wide range of usefulness. The index, although full, is not carefully compiled.

Hygiene for Nurses. By Isabel McIsaac, author of "Primary Nursing Technique" (*New York: The Macmillan Company, 1908.*)

This, the second, in what is designed by Miss McIsaac as a series of elementary text-books for nurses, has reached us from The Macmillan Company, and in its 200 pages of rather large type printing may be found a surprising amount of suggestive matter on hygiene as related to a nurse's work. Miss McIsaac has wisely used her material where nursing experience has not heretofore covered the ground in the form of entire reports or excerpts from government, city or committee bulletins, or as quotations from standard writings on hygiene, and thus her book is authoritative in a way it could not otherwise be. Where the author's personal comment is introduced the statements are often pleasantly individual in style, and Miss McIsaac does not hesitate to give to a spade it proper name. Dirt is dirt in her estimation, and can be removed only by methods for getting rid of dirt—preferably as a rule by old-fashioned scrubbing appliances, with soap and water. However, nurses are told how and when to use disinfectants—they have presumably had the *why* in their technical lectures—how to dispose of sewage and garbage according to modern practices, and by searching diligently, under several separate headings, one arrives at a fair notion of the value of sunlight as a germ-destroyer. In the table of contents may be noted "Soil and Water," "Personal," "School" and "Household Hygiene," "The Hygiene of Occupation," relating especially to women and children, and with numerous opinions, even from foreign countries,—but why so many prior to 1900 when the remainder of the book is so eminently up to date?—and the book ends with "Quarantine," The drainage and sewage methods are clearly presented and are given practically all of the few illustrations by cuts in the book. The subject of "Food," including its preservation and adulteration, is made quite interesting. "Causes and Dissemination of Disease" is another chapter, and under the title of "Air" is included ventilation, heating and lighting, besides climate and the composition of air.

"Hygiene for Nurses" comes at an opportune moment, for never before has all the world been so intently seeking health by preventive measures, and nurses, it would seem, have given to them a splendid opportunity to rightly instruct the public in this regard.

A Dictionary of Medical Treatment for Students and Junior Practitioners. By Arthur Latham, M. D., Physician to St. George's Hospital, London. (*Philadelphia: P. Blakiston's Son & Co., 1908.*)

The writer of this work has endeavored to give in small compass the main points in the treatment of medical diseases as distinct from surgical or special practice. The work is intended for students and young practitioners and might be described as a pocket dictionary. On the whole it may be said that the discussion of methods of treatment is most satisfactory and it is a pleasure to find that therapeutic measures other than the giving of drugs receive adequate attention. There are some points, however, about which we would have preferred other advice to be given. One is as regards the indications for tapping in pleurisy with effusion. The old indications as to the amount of fluid, degree of distress, etc., are given here, but the advisability of not waiting for these but tapping as soon as fluid can be recognized is becoming more and more the rule, and it is important that students should be taught this. The importance of early tapping cannot be over-emphasized. The references to the use of the bath treatment in typhoid fever hardly do justice to it and the advice to give opium by enema for abdominal tenderness in this disease cannot be endorsed. The use of gelatine injections in the treatment of aneurism has been generally discredited, the same result being gained by giving the calcium salts by mouth. Under epidemic cerebrospinal meningitis there is no mention of the use of the specific serum. Despite the points which have been noted, on the whole the teaching of this work is sound and it can be cordially recommended as a pocket handbook.

Guide to the Clinical Examination and Treatment of Sick Children. Second edition, greatly enlarged and rewritten. By John Thomson, M. D. (*Chicago: W. T. Keener & Co., 1908.*)

The subject is treated in 629 pages of rather large print, in which the author tries to treat the most important diseases of infancy and childhood. The book is written in quite an attractive manner and its short compass will no doubt recommend itself to many readers. At the same time it can hardly be regarded as a very valuable addition to the pediatric literature.

Vaccine Therapy and the Opsonic Method of Treatment. By R. W. Allen, M. D., B. S. (Lond.), etc. Second edition. (*Philadelphia: P. Blakiston's Son & Co., 1908.*) Price, $2.

The second enlarged edition of this book was called forth, according to the author, by the great progress in vaccine therapy during the year elapsing from the date of publication of the first edition. In its pages are found all the data concerning vaccination based on opsonic estimations in various diseases as well as a clear exposition of the methods employed. As a review of

modern work along these lines the book cannot be criticised; it is compact, well-written, extremely interesting, and consequently valuable as a collection of results obtained. We do not believe, however, that the present state of opsonic and vaccine therapy justifies the extreme enthusiasm of the author as to the present and future status of this most important question. Certainly there is sufficient evidence of the errors of the methods employed to warrant some conservatism in predicting the ultimate outcome of vaccine therapy and opsonic treatment. S. S.

Abdominal Operations. By B. G. A. Moynihan, M. S. (London), F. R. C. S. (Leeds). Second edition, thoroughly revised. (*Philadelphia and London: W. B. Saunders Company, 1906.*)

The book is divided into five sections as follows: General Considerations; Operations upon the Stomach; Operations upon the Intestines; Operations upon the Liver; Operations upon the Pancreas and Spleen.

No gynecological operations are described, nor is the surgery of organs which do not lie entirely intraperitoneally, such as the kidney and bladder, considered. The operations for hernia are also omitted.

The author has very rightly omitted the descriptions of the various mechanical devices for intestinal anastomoses, as they have served their purpose and are now out of date.

There is a thorough discussion of each organ in turn, and only the latest and most practical operations are described.

There are numerous references scattered throughout the book. The book is well printed, the illustrations are good, and the work is by far the best as yet published on abdominal operations.

J. S. D.

A Manual of Diseases of the Nose and Throat. By Cornelius Coakley, A. M., M. D. Fourth edition. (*New York: Lea and Febiger, 1908.*)

The new edition of this manual demonstrates that this work has filled a want, namely, a treatise in this specialty which is concise and at the same time up-to-date and comprehensive. While intended primarily for students and general practitioners, it is also useful to those making a specialty of this branch. This edition deserves the same praise that former ones have received in this journal.

A few of the chapters do not, however, meet with unqualified approval. Chapter IV is entitled "Antisepsis in Operations upon the Upper Respiratory Tract" and the author devotes it to the description of methods of making the upper air tract sterile. The chapter would have been better named "Asepsis in Operations on the Upper Air Tract" and directions as perfect as that used in performing a laparotomy should be given for a special technique in this branch of surgery. Asepsis should be insisted on in these operations and the cases should be made hospital patients. To those who hold this view the results obtained have justified this course. Infections following operations on the upper air tract have resulted, not so much from organisms present there, as from those introduced by the operator's unclean hands, instruments or dressings.

The chapters on the nasal accessory sinuses are complete and especially satisfactory. However, the author's frequent changes in method in treating disease of some of these cavities, indicates present unsettled opinions regarding these troublesome cases.

The most serious drawback to the work is the antiquated treatment of hypertrophies and disease of Waldeyer's lymphatic ring. The use of the Loewenberg forceps and of the various forms of tonsillotomes and of galvano-cautery puncture of the tonsils has been abandoned by most of the advanced laryngologists of the present day. Since we know that all parts of the hypertrophied tonsil are diseased, the only rational method is to remove it as completely as possible. In the case of adenoids this can be best done with sharp-cutting curettes. The faucial tonsils can be completely dissected out with their capsule by the simple and safe method of Worthington. A series of several hundred cases has demonstrated the value of this method both for adults under cocaine anæsthesia and for children under ether.

Sylvan Rosenheim.

International Clinics. Vol. IV. Eighteenth series. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

The contributors to this volume are as usual both American and European, and their papers cover a wide ground under the general headings of Treatment, Medicine, Surgery, Gynecology and Obstetrics, etc. One of the most striking features of these series is the difference shown in method of presenting a subject by our own and the foreign doctors. There is usually a greater conciseness in the articles contributed from abroad, but in general merit they are quite even. There is no "Clinic" of especial note in this volume, which offers, however, a number of papers of interest. Cumston's review of the subject of "Paronychia Lateralis" and T. R. Brown's article on "Splanchnoptosis" will find many readers as they both describe well common affections which are often as much trouble to the doctor as to the patient. But any reader who picks up the book will find it worth his while to read one or more of the "Clinics."

Essentials of Medicine. A Text-Book of Medicine for Students Beginning a Medical Course, for Nurses and for all Others Interested in the Care of the Sick. By Charles Phillips Emerson, late Resident Physician, The Johns Hopkins Hospital; and Associate in Medicine, The Johns Hopkins University. pp. 372. (*Philadelphia and London: J. B. Lippincott Company.*)

To quote from the preface—by no means the least interesting part of a thoroughly interesting book—"Many American students lack perspective in their medical studies. They do not learn the A, B, C of disease first and then proceed to its more difficult study. . . . . Our nurses often know a great deal in a general indefinite, inaccurate way. They seldom have a clear, sharp mental picture of the elements of a subject."

Dr. Emerson has provided us with a work which, if carefully read, will go far towards alleviating the mental dyspepsia now so prevalent, not only among second and third year students and nurses, but also among others of maturer years. In a book of somewhat less than 400 pages, parts of which are taken up by illustrations, he has given us a concise but clear account of the more salient points relating to the origin and nature of the more common disease processes. Possibly the most subtle charm of the book lies in the fact that while the reader is having expounded to him the fundamental and elementary, he does not consciously find himself convicted of the ignorance which he may (or may not) be guilty of. Quiz Compends (we have heard) are sometimes used by fourth-year students and even by graduates, but they are not given a prominent place in their book-shelves. Dr. Emerson's book is not a Quiz Compend; it may be found on any one's office table and yet the owner may still look the world in the face unblushingly.

In a work of this kind it would, of course, be easy to pick out not a few errors of omission and of commission, but this is a very small part of the reviewer's function. In view of the present deluge of so-called medical literature it becomes his main duty to state, after careful consideration, whether he considers this or that book to be "worth while." Dr. Emerson's book will not only serve to clear away a certain amount of chaos but will also stimulate the reader to further accurate study. We believe that it will prove an efficient aid not only to junior students and nurses but also to others—not excepting their teachers. F. R. S.

BOOKS RECEIVED.

Vaccine Therapy and the Opsonic Method of Treatment. By R. W. Allen, M. D., B. S. (Lond.). Second edition. 1908. 8vo. 244 pages. P. Blakiston's Son and Company, Philadelphia.

Anatomie und Mechanismus der Skoliose. Von Dr. Carl Nicoladoni. Mit 54 Figuren auf 37 Tafeln und dem Porträt des Verfassers. 1909. 8vo. 58 pages. Urban & Schwarzenberg, Berlin und Wien.

Modern Medicine. Its Theory and Practice. In Original Contributions by American and Foreign Authors. Edited by William Osler, M. D., assisted by Thomas McCrae, M. D. Volume V. Diseases of the Alimentary Tract. Illustrated. 1908. 8vo. 903 pages. Lea & Febiger, Philadelphia and New York.

Essentials of Medicine. A Text-Book of Medicine for Students Beginning a Medical Course, for Nurses, and for All Others Interested in the Care of the Sick. By Charles Phillips Emerson, M. D. Illustrated by the Author. [1908.] 8vo. 383 pages. J. B. Lippincott Company, Philadelphia and London.

Guide to the Clinical Examination and Treatment of Sick Children. By John Thomson, M. D. Second edition, greatly enlarged and rewritten. With 160 illustrations. [1908.] 8vo. 629 pages. W. T. Keener & Co., Chicago.

Diseases of the Genito-Urinary Organs and Kidney. By Robert Holmes Greene, A. M., M. D., and Harlow Brooks, M. D. Second edition, revised and enlarged. With 323 illustrations. 1908. 8vo. 605 pages. W. B. Saunders Company, Philadelphia and London.

A Text-Book of General Bacteriology. By Edwin O. Jordan, Ph. D. Fully illustrated. 1908. 8vo. 557 pages. W. B. Saunders Company, Philadelphia and London.

A Text-Book of General Pathology. By J. Martin Beattie, M. A. (N. Z.), M. D. (Edin.), and W. E. Carnegie Dickson, M. D., B. Sc., F. R. C. P. (Edin.). With 162 illustrations and 4 colored plates from original preparations. 1908. 8vo. 475 pages. P. Blakiston's Son & Co., Philadelphia.

Oxford Medical Publications. A System of Syphilis. In six volumes. Edited by D'Arcy Power, M. B. Oxon., F. R. C. S., and J. Keogh Murphy, M. D., M. C. Cantab., F. R. C. S. With an introduction by Jonathan Hutchinson, F. R. S. Vol. II. 1908. 8vo. 387 pages. Henry Frowde, London; Hodder & Stoughton, London.

Surgery of the Upper Abdomen. In two volumes. By John B. Deaver, M. D., LL. D., and Astley Paston Cooper Ashhurst, M. D. Vol. I. Surgery of the Stomach and Duodenum. With 76 illustrations, several of which are printed in colors. 1909. 8vo. 468 pages. P. Blakiston's Son & Co., Philadelphia.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Eighteenth series, Vol. IV. 1908. 8vo. 310 pages. J. B. Lippincott Company, Philadelphia and London.

Medical Gynecology. By Samuel Wyllis Bandler, M. D. With original illustrations. 1908. 8vo. 676 pages. W. B. Saunders Company, Philadelphia and London.

Oxford Medical Publications. The Rectum, its Diseases and Developmental Defects. By Sir Charles B. Ball, M. Ch., F. R. C. S. I., Hon. F. R. C. S. Eng. 1908. 8vo. 332 pages. Henry Frowde, London; Hodder & Stoughton, London.

Oxford Medical Publications. Diseases of the Heart. By James Mackenzie, M. D., M. R. C. P. 1908. 8vo. 386 pages. Henry Frowde, London; Hodder & Stoughton, London.

A Text-Book of Genito-Urinary Diseases. Including Functional Sexual Disorders in Man. By Doctor Leopold Casper. Translated and edited with additions by Charles W. Bonney, B. L., M. D. Second edition, revised and enlarged. With 230 illustrations and 24 full-page plates, of which 8 are in colors. 1909. 8vo. 645 pages. P. Blakiston's Son & Co., Philadelphia.

Practical Bacteriology, Blood Work and Animal Parasitology. Including Bacterilogical Keys, Zoölogical Tables and Explanatory Clinical Notes. By E. R. Stitt, A. B., Ph. G., M. D. With 86 illustrations. 1909. 12mo. 294 pages. P. Blakiston's Son & Co., Philadelphia.

A Text-Book of Operative Surgery. Covering the Surgical Anatomy and Operative Technic Involved in the Operations of General Surgery. By Warren Stone Bickham, M. D., Phar. M. Third edition, greatly enlarged, containing 854 illustrations. 1908. 8vo. 1206 pages. W. B. Saunders Company, Philadelphia and London.

Surgery. Its Principles and Practice. By Various Authors. Edited by William Williams Keen, M. D., LL. D., and John Chalmers DaCosta, M. D. Vol. IV. With 582 illustrations, 22 of them in colors. 1908. 8vo. 1194 pages. W. B. Saunders Company, Philadelphia and London.

Pulmonary Tuberculosis and Its Complications. With Special Reference to Diagnosis and Treatment. By Sherman G. Bonney, A. M., M. D. With 189 original illustrations, including 20 in colors and 60 X-ray photographs. 1908. 8vo. 778 pages. W. B. Saunders Company, Philadelphia and London.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis, M. D. Vol. IV. December, 1908. 8vo. 333 pages. Lea & Febiger, Philadelphia and New York.

The National Standard Dispensatory. Containing the Natural History, Chemistry, Pharmacy, Actions and Uses of Medicines. In Accordance with the Eighth Decennial Revision of the United States Pharmacopœia, as Amended to 1908. By Hobart Amory Hare, B. Sc., M. D.; Charles Caspari, Jr., Ph. G., Phar. D.; Henry H. Rusby, M. D.; Joseph F. Geisler, Ph. C.; Edward Kremers, Ph. D., and Daniel Base, Ph. D. Second edition, thoroughly revised and much enlarged. 1909. 4to. 2011 pages. Lea & Febiger, Philadelphia and New York.

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OBSERVATIONS ON EXPERIMENTALLY INDUCED CHOKED DISC.

By Harvey Cushing, M. D., and James Bordley, Jr., M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

As is well known, there have been two conflicting views in regard to the etiology of the characteristic changes in the eye-grounds which accompany cerebral tumors. One of these views accredits the condition to purely mechanical causes of one sort or another; the other, to toxic or inflammatory ones.

Hence the terminology on the one hand indicates a stasis phenomenon—"*Stauungspapille*," "choked disc" or "papill-œdema"; on the other, an inflammatory process which produces what von Leber called a "neuritis" or "papillitis," according as reference is made to the entire nerve or only its intraocular portion. So loosely are these terms used that a number of recent writers speak of the early stage of retinal congestion as an "optic neuritis" which is followed by a "choked disc" when the resultant swelling of the papilla reaches a measurable degree—placed, indeed, by some as high as three or four diopters. If these distinctions are to be drawn it would seem preferable to reserve, as was originally done by Gowers, the term optic neuritis or papillitis, indicating inflammation, for the later stage when round-celled invasion and neuroglial proliferation have occurred as the sequel of a long-standing œdema, and to speak of the primary congestion from stasis as a choking of the disc.

In order to avoid confusions of this sort, it has seemed best to us, whatever designation is to be employed, to indicate the entire process by one term which embraces all grades of the retinal lesion, from the earliest congestion (hyperæmic stage) to the final destruction of the optic fibers (atrophic stage).

For many reasons we have chosen to adhere to Sir Clifford Albutt's well-established term "choked disc,"[1] for it is ex-

[1] The term is not entirely satisfactory, for though it implies stasis and swelling of the nerve-head it leaves retinal œdema and other changes, especially the degenerative ones, out of consideration.

In order to express both the "mechanical" and "inflammatory" processes in one term, Baas introduced the combination "*Stauungspapillitis*," and J. Herbert Parsons in his recent volume (The Pathology of the Eye, Vol. IV, 1908) strongly favors the term "papillœdema," which seems to have been used independently by Elschnig. This term has met with some favor, and has been used by George E. de Schweinitz and Halliday in a

pressive, and was introduced as an English equivalent for von Graefe's original designation *Stauungspapille*. There would be a further reason for its appropriateness could it be conclusively shown by experiment that all gradations of the process may represent the mechanical effects of increased intracranial pressure—and whether this leads primarily to venous stasis in the optic veins (von Graefe) or to cerebrospinal fluid stasis in the optic sheath (Schmidt-Rimpler and Manz) is of secondary consideration.

Before our experiments were undertaken, we must admit having been somewhat prejudiced in favor of a mechanical explanation, owing to rather an unusual experience with a long series of clinical cases, now embracing over four hundred instances of the condition we are pleased to call choked disc, many of the observations being difficult to explain on any other basis.

Briefly, these clinical observations may be divided into three groups. They have shown us (1) that the eye-grounds in most cases of cerebral trauma, often a few hours after the injury, show evidences of stasis, which may rapidly lead to œdema of a measurable height, first appearing on the nasal side of the disc. The increase of pressure may not necessarily be due to a large, actual extravasation of blood, as in apoplexy, but to a simple cerebral œdema consequent upon the minute extravasations of concussion or contusion.[2] In these cases the neuro-retinal lesion, which is indistinguishable from certain grades of so-called "optic neuritis," cannot possibly be due to other than the mechanical influence of increased intracranial tension, and it is well known that prompt operative relief from the pressure leads often to an equally prompt subsidence of the congestion and œdema of the nerve-head.

Further (2), owing to the frequent similarity between the condition seen in the eye-grounds of patients with tumors and of those in whom nephritis is accompanied by headache and vomiting, or other signs suggestive of increased intracranial tension, we have been led to believe that the process in the two conditions is largely of a common origin and due to pressure, which in the latter case results from cerebral œdema. Thus we have found that the neuro-retinal changes in nephritis—the so-called "*neuro-retinitis albuminurica*"—can often be temporarily modified, as Sänger has also observed, by a lumbar puncture which will disclose a superabundant fluid under tension; and what is more may be permanently modified by cerebral decompression. The same is true of many cases of cerebral arteriosclerosis when vascular disease has led to areas of cerebral œdema.

Finally (3), we have seen, in corroboration of the results of others, a great number of instances of partial or total subsidence of a choked disc after simple decompression.[3] This, more than any other factor, has served to favor a mechanical rather than a toxic source of the neuro-retinal change, which first or last is observable in most cases of cerebral tumor.

Experimental Observations.

Some years ago (1900) during the course of an investigation concerning the symptomatic phenomena of cerebral compression it was noted by one of us that the rhythmicalities of pulse-rate and blood-pressure, which were often brought out by a general increase of intracranial tension, produced after the method of Leonard Hill by letting fluid under pressure into the subdural space, were observable in the eye-grounds much as they were through the glass window inserted in the skull over a dural defect. In other words, a condition of venous stasis of cortex and retina was the first sign of vascular disturbance. When the pressure was gradually increased to a point equalling arterial tension, there occurred a compensatory rise in blood-pressure which was attributed to stimulation of the vasomotor center by the temporary bulbar anæmia. If, during this regulatory process, Traube-Hering waves were elicited, as was often the case, the retinal arteries would come into view as the arterial pressure exceeded the intracranial tension, and would disappear as the wave receded to fall momentarily to a lower level—and so on indefinitely.[4]

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recent valuable paper (The Operative Treatment of Papillœdema, etc. Transactions of the College of Physicians of Philadelphia, 1908).

Though at first we were inclined to accept "papillœdema," this has seemed unwise on further consideration, for the term actually conveys nothing more of the process than does "choked disc," and its adoption would only add confusion, unless there were some understanding that the new term was expressly introduced to cover the entire process. This is not likely to occur since Parsons, on the whole, seems to be in favor of a mechanical origin of the lesion; whereas, Elschnig is emphatically opposed to any other than an inflammatory one.

Marcus Gunn's subdivision (British Med. Journ., Oct. 26, 1907) of the clinical stages of the lesion should be generally adopted, but with de Schweinitz we look with disfavor on his designation "tumor papillitis."

[2] This is true also of postoperative extravasations or œdema, and the sign is so valuable an indication of such an accident that it is our custom after all critical cranial operations not only to keep a continuous record of pulserate and blood pressure, but also to keep watch of the retina for early signs of a choked disc.

[3] Recent important contributions to this subject have been made by Eugene v. Hippel in Germany (v. Graefe's Archiv für Ophthalmologie, 1908, Bd. LXIX), by G. E. de Schweinitz in this country (Loc. cit.) and by Leslie Paton in England (Transactions of the Ophthalmological Society of the United Kingdom, 1905, Vol. XXV, and 1908, Vol. XXVIII). It is quite probable that Paton's studies of Sir Victor Horsley's cases at the National Hospital, before and after operation, will modify the view so widely held in Great Britain favoring the inflammatory origin of the lesion. It will be recalled that this view was stoutly supported by Sir William Gowers in his classic "Medical Ophthalmoscopy" (London, 1890, p. 78). A distinguished neurologist in this country has recently written (Boston Med. and Surg. Journ., February 1, 1906), "The toxic factor in the production of neuritis has long been recognized, and it is believed by many to be of importance in the production of headache, mental disturbances and other symptoms. Relief of pressure will, therefore, have little influence upon any symptoms of toxic origin."

[4] It is to be noted that this reaction of the laboratory experiments, called out by an acute increase in tension, is comparable only to the reaction in clinical cases which occurs with hæmorrhage or rapid œdema: it is not a characteristic of the long-standing or chronic increase of tension which occurs in cases of

At that time the observer's interest was directed chiefly toward the blood-pressure reaction, and for this reason, as well as from lack of familiarity with the picture of retinal œdema in the dog, the condition was overlooked.

In 1906, Eyster, working in Howell's laboratory, employed the same methods for the study of Cheyne-Stokes respiration, finding that during the period of blood-pressure elevation the stage of apnœa corresponded with the recession of the blood-pressure wave, the respiratory stage with its crest.[5] During the course of his experiments, some of which we attended, a high grade of choked disc was found to have been produced by this method of raising pressure. The observations, therefore, were repeated for the purpose of studying the retinal condition alone.

The method, which in principle is practically the same as that originally followed by v. Schultén and others, needs no especial description. With the animal under anæsthesia, a small trephine opening is made over the parietal eminence; the underlying circle of dura is cut away, and a snugly fitting canula is screwed into the cranial opening until its inner end is flush with the dura (Fig. 1). A long rubber tube connects this canula with a pressure flask, which may be raised or lowered and which contains normal salt solution at body temperature. A mercury manometer is inserted in the course of the tube for the purpose of recording the level of fluid pressure exerted against the brain. As Adamkiewicz has emphasized, fluid thus introduced passes out more or less freely from the cranial chamber, the escape taking place largely by way of the arachnoidal villæ directly into the large dural sinuses. This outflow, however, varies greatly in different experiments and even if considerable in amount affects but little the measured increase of tension.

A. The notes of two fairly typical experiments to show *the effects of an acute increase of tension from the subdural introduction of fluid* are as follows:

Observation IV.—December 6, 1905. Chlorotone and ether anæsthesia. Brown and white fox terrier.[6]

Atropin used to dilate pupils. Canula over left hemisphere; pressure with normal salt solution deeply stained with methylene blue. Examination of fundus shows nothing abnormal except in the left eye, where at lower edge of the disc a small patch of opaque nerve fibers is observed. The disc occupies the same plane as the retina. The veins and arteries are normal in size and color. No difference in condition apparent in the two eyes. Slight pressure on the eyeball completely obliterates the large veins on the optic disc.

2.38 p. m. Fluid allowed to enter cranial chamber with a pressure of 20 mm. Hg.

2.50 p. m. *Left eye:* Veins tortuous and disc swollen 2 D. under inferior temporal vein. *Right eye:* No changes beyond filling of veins, the small vessels showing a distinct increase in size.

2.58 p. m. Pressure raised to 30 mm. Hg. with resulting increase in tortuosity of the veins. Pulsation of veins noted at this stage.

3.06 p. m. Distinctly swollen right disc. No blue color showing in either eye.

3.25 p. m. By this time there has occurred a definite swelling of both discs without any further increase in the size or tortuosity of the veins since the last note.

3.35 p. m. A definite exophthalmos of both eyes, with dilatation of conjunctival veins, has occurred.

3.48 p. m. By compressing the eyeball it is possible to reduce the swelling of the disc in the right eye and to bring veins back to normal proportions. The disc has not increased in height on the left side.

4.03 p. m. On liberating right eye from external digital pressure exerted for several moments, some œdema is seen to have occurred in the conjunctiva. No change has appeared in the pupil of either eye.

4.18 p. m. Pressure raised to 40 mm. Hg. leads to dropping of fluid from the nose and to evident bulbar symptoms, so that pressure is discontinued.

Observation VI.—December 13, 1905. Chlorotone and ether anæsthesia. Fox terrier.

Atropin used to dilate pupils. Ophthalmoscopic examination shows hypermetropia of 2 D.; both retinæ normal; careful topographical study made of disc and vessels.

Canula inserted over left hemisphere, pressure flask containing warm normal salt solution deeply stained with methylene blue.

3.04 p. m. Fluid allowed to enter cranial chamber, pressure flask being slowly raised to level equalling 30 mm. of Hg. Distinct dilatation of veins; pulsation observed in veins.

3.07 p. m. Œdema commencing to appear in disc with no appearance of blue fluid: veins tortuous: edges of disc indistinct: height 3.5 D.

3.15 p. m. Retina has become œdematous and veins do not appear quite so large: height of disc 6 D.

3.18 p. m. Pressure increased to 55 mm. Hg.

3.28 p. m. A small hæmorrhage has occurred at upper margin of right disc, apparently the result of the giving way of a small venule.

3.48 p. m. Condition has remained practically unchanged, though patches of the disc seem to have a bluish tinge (?) as though stained by the fluid. 50 cc. of fluid has run in from pressure flask.

3.52 p. m. Pressure increased to 90 mm. Hg.

3.59 p. m. Moisture beginning to drip from nose. General appearance of fundus shows a deeper hue. As yet no outspoken change in pulse-rate or respiration.

4.05 p. m. Pressure suddenly raised to 140 mm. with temporary cessation of respiration, and convulsion. Pressure increased to 160 and then to 180 with periodic respiration and high-pressure vagus pulse. Pressure of 240 mm. of Hg. necessary to produce usual terminal phenomena of compression.

Autopsy.—Brain found deeply stained, particularly right hemi-

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brain tumor or hydrocephalus. Through failure to appreciate this, confusion has arisen in the minds of many clinical observers in regard to the blood-pressure readings of tumor cases, for in them a considerable increase of intracranial pressure need not elicit any striking rise in arterial pressure.

[5] J. A. E. Eyster, M. D.: Blood-Pressure Changes in Cheyne-Stokes Respiration. Johns Hopkins Hospital Bulletin, 1906, Vol. XVII, p. 296. Also Clinical and Experimental Observations upon Cheyne-Stokes Respiration. Journal of Experimental Medicine, 1906, Vol. VIII, p. 565.

[6] It may here be stated that in this, as in all other of the experiments, the animals were stupefied by the ingestion of a physiological dose of chlorotone before the administration of ether. and further that in all cases in which recovery from the anæsthetic was permitted, every effort was made, by the continuance of narcotics, to completely alleviate any possible discomforts, just as would be done with human beings suffering from comparable maladies.

sphere. No apparent œdema or blue staining of orbital tissues, though marked dilatation of all veins is present. No blue staining of frontal or ethmoidal sinuses. Brain not œdematous but stained a deep blue, particularly over the right hemisphere. Visible blue staining of cortical nervous system extends part way down the cord, but not beyond lower thoracic region. Both optic nerves deeply stained, and a distinct increase of fluid is apparent in Schwalbe's sheath. No trace of blue staining in abdominal or thoracic viscera.

The eyes were hardened in formalin and cut, showing, in spite of the shrinkage during fixation, a swelling of the disc which was definite though by no means as great as a height of 6 D. would indicate.

With the object of fixing the œdematous retinal tissues under the conditions of the experiment, so as to obviate in a measure the inevitable shrinkage of subsequent fixation, the above observations were modified by using 4 per cent. formalin instead of salt solution for the pressure fluid.

The results of an experiment of this kind may be briefly recounted. With the animal under anæsthesia the warmed formalin solution was allowed to enter as usual over the left hemisphere and was held at the constant pressure of 30 mm.

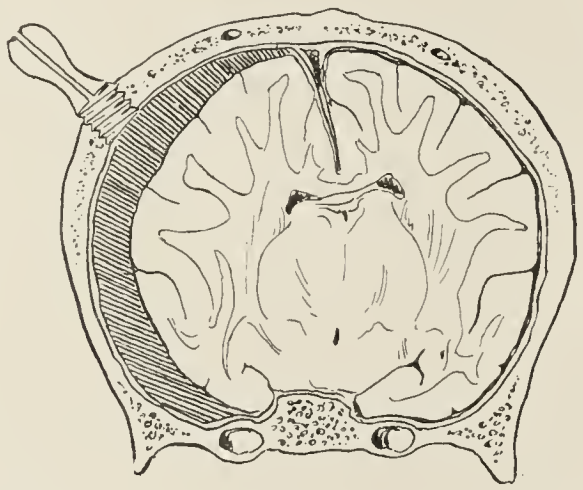


Fig. 1.—Sketch of coronal section of cranium to show dislocation of brain, in general-pressure experiment with methylene blue formalin. Fluid chiefly over left hemisphere, but tension presumably everywhere equal and eyes equally affected.

of Hg. In addition to the changes characterizing the experiments just detailed, an exophthalmos appeared on the contralateral (right) side soon after the pressure was exerted, and not until shortly before death did it occur on the side over which pressure was primarily being exerted.[7] Breathing continued nearly unaffected for an hour and a half, when a primary respiratory paralysis ushered in death.

The postmortem examination showed how, even when introduced into the free subdural space, the fluid need not find its way in equal amounts everywhere in the cranial chamber, though doubtless, from dislocation of the falx and hemisphere, apparent in this case (Fig. 1), the pressure effects may be transmitted everywhere equally. Sections were made of the eye and show (Fig. 2) well fixed the œdematous swelling of the nerve-head and distension of the sheath.

[7] In passing, it may be noted that in acute experiments of this type, with supposed "general pressure" from fluid, we have not infrequently seen the œdema of the disc and retina occur first in the opposite eye, to be followed later by equal changes in the near eye.

These observations, therefore, tend to confirm the experiments of Merz and Schmidt-Rimpler, the results of which were not corroborated by Kampherstein and Heine and have been most emphatically opposed by Adamkiewicz, who says:[8] "Künstliche Drucksteigerungen im Schädel bei Thieren niemals zu einer 'Stauungspapille,' sondern regelmässig nur zu Stauungen in der Venen der Chorioidea führen."

B. To determine *the effects on the eye-grounds of simple acute compression unassociated with the artificial introduction of fluid* but in which the fluid normally present plays an identical rôle, the following type of experiment was made:

Observation V.—December 8, 1905. Chlorotone and ether anæsthesia. Medium-sized, long-haired mongrel dog.

A one-inch trephine opening was made in the mid-line just anterior to the occipital protuberance, exposing longitudinal sinus and a portion of dura over each hemisphere.

The condition of the eye-grounds remained unaffected by this cranial operation. While pressure with the finger was being exerted against the exposed area of dura the ophthalmoscope showed first a filling of the larger veins and then the gradual appearance over the disc of small venules not before observable. Many of these smaller venules dilated to a considerable size, accounting for the hyperæmic appearance of the disc.

A few minutes of pressure sufficed to produce a swelling of the disc of 2 D.: a stronger pressure continued for some time increasing it to 7 D., with the associated characteristic appearances. On releasing the pressure the venous engorgement rapidly subsided and the small distended venules faded away. No change in the arteries was observed.

After an interval of five minutes strong pressure was reapplied and continued for twenty minutes, forcing the disc to a height of 7 D., and causing a marked œdema of the retina as well.

This neuro-retinal swelling, on again relieving the pressure, persisted for an hour, at which time a futile attempt was made to open the globe so as to directly observe the swelling, but this was unsatisfactory, from the local hæmorrhage.

C. A number of experiments of the type of A and B were then made, with the optic nerve itself exposed so that by direct observation *the effect of intracranial pressure on the vaginal sheath itself could be seen.*

Observation XI.—January 3, 1906. The experiment was conducted as in type A, with the usual preliminaries and the canula introduced over the left hemisphere. Salt solution deeply stained with methylene blue was used for the pressure fluid.

After making a number of the usual pressure observations the flask was lowered to zero level and a lateral orbital exposure made by continuing the scalp incision forward and around the eye. On removing the soft parts from the orbit and temporal fossa the globe and nerve were isolated back to the optic foramen.

The pressure flask was then raised to 30 mm. of Hg., with resultant filling of the sheath and visible enlargement of the ampulla. It was thought, too, that there was a palpable increase in intraocular tension. At the same time some of the veins over the globe (anterior ciliary), which had become divided in the operation, but which did not require ligation, began to bleed, others to distend and become tortuous behind their terminal thrombi. A systolic pulse was noted also in the sheath similar to that seen in the manometer during a pressure experiment

[8] A. Adamkiewicz: Zur Frage über das Wesen der sogen. "Stauungspapille." Neurologisches Centralbl. März 1, 1905, Bd. XXIV, p. 206.

when compression suffices to call out a strong vagus pulse with rise in arterial tension—a pulse, in the latter case, transmitted to the compressing fluid.

An exophthalmos of the unexposed eye occurred before death during some of the later observations, for there were many repetitions of the observation during the course of a few hours.

Autopsy.—The left hemisphere was blue-stained, with only a trace of coloring on the right, there being none in the right optic sheath. The left was faintly stained fairly well down toward the ampulla.

Similarly, other observations of the type B were made in which globe and optic nerve were isolated, but instead of introducing fluid to increase tension, digital compression was made on an exposed area of dura. In these cases, as in the above, the nerve sheath and ampulla would bulge coincidently with the rapidly forming œdema of the disc, the fundus being especially well seen in these cases, owing to the wide pupil. At the same time the vessels accompanying the optic sheath externally were seen to dilate and become markedly tortuous. The same thing was shown by the ophthalmoscope to take place in the retinal vessels, and in one instance the appearance of movement of the venous blood in the larger veins over the disc was observed—an appearance which can be best seen through a cerebral window during a certain stage of compression in which there is a tendency to flattening of the veins and which may, in this instance, have been indicative of the slightly increased intraocular tension which seemed to be present in these isolated globes.

During the course of the series of observations some casual efforts were made to determine whether the fluid distending the sheath in the two types of experiment was in the subdural or subarachnoid chamber. There is little doubt but that in most tumor cases the pent-up fluid is found, as might be expected, in the subarachnoid spaces, the distension of which in the neighborhood of the chiasm can be well seen in many cases of intracranial tension accompanied by choked disc, provided the brain is hardened in situ and a coronal section made through this region (Fig. 3). Similarly, in the choked disc of man not only can the distension be shown to be in the subarachnoid space on microscopic sections of the nerve (Fig. 4), but also if a window is made in the wall of a well distended ampulla in a case with choked disc of long standing, the thickened meshwork of the arachnoidal spaces can be well seen (Figs. 5 and 6).

Whether or not, when the fluid is introduced under the dura as in experiments of the type A, it passes into and distends the subdural space of the sheath we are a little uncertain. This would seem to be probable, from the study of certain cases in which the pressure fluid contained fine particles of animal charcoal in suspension or when India ink is used. Doubtless in the majority of clinical cases the distension occurs in the subarachnoid spaces where physiologically the fluid first appears, and with the exception of the various œdemas, traumatic and otherwise, the subdural space at operation usually is found comparatively dry (Figs. 7 and 8).

It is apparent from these first observations that *a neuro-retinal œdema with marked elevation of the papilla may accompany conditions which raise intracranial pressure whether from the introduction of new fluid under tension or from transmission of tension to the fluid already present;* and, furthermore, *that coincident with* (possibly antecedent to) *the production of the neuro-retinal change there will occur a visible distension of the optic sheath.*

This being established an effort was made to determine in how far venous stasis alone was capable of producing the lesion under investigation.

D. Experiments of the following type were undertaken in the attempt to determine *the effects of venous stasis alone.*

Observation 11.—November 3, 1905. With an animal under anæsthesia and a simple blood-pressure band of the Riva Rocci pattern encircling the neck the pressure in the band was raised to 85-90 mm. of Hg. With this degree of pressure a distinct widening occurred, particularly in the smaller retinal veins. With further increase in the pressure the dilatation affected the larger vessels, which became slightly tortuous. However, even with a long standing pressure of this kind, slightly below arterial pressure, and in spite of the marked passive congestion of the extracranial tissues, the evidences of stasis in the eye-grounds not only did not increase to the point of causing œdema but in the course of time the congestion actually subsided.

The conditions here were comparable to the similar experiment made on man (on the person of one of us),[9] although naturally in this case the pressure could not be so long continued. In other words, evidences of stasis alone, not reaching a degree sufficient to cause extravasation of fluid into the retinal tissues, resulted from cervical compression, and it was thought in the case of the dog that the large venous sinuses passing into the spinal canal sufficed to carry away enough blood to permit the total obstruction of the four cervical jugulars.

The experiment was given a more severe test with an animal kept for twenty-four hours under profound chlorotone anæsthesia and with an elastic tourniquet passed under the isolated trachea and tightly bound around the remaining cervical structures. This led first to a marked distension of the extracranial veins, especially well seen in the conjunctival and anterior ciliary vessels; also to some lachrymation, a stasis exophthalmos, and a temporary slow vertical nystagmus. The retinal veins became large and tortuous and an extravasation occurred in the deep tissues of the left retina. The arteries remained full, supposedly owing to their vertebral supply. In the course of an hour, however, the distension of the retinal veins and the exophthalmos disappeared, no choking of the disc or œdema of the retina having occurred in the interval. Eighteen hours later the eyes showed no change, though there was considerable œdema of the extracranial tissues headward to the band.

A further modification of these stasis observations was made during the course of the experiments of the type C with an isolated globe and optic nerve. When a delicate constricting

[9] The Blood Pressure Reaction of Acute Cerebral Compression, Illustrated by Cases of Intracranial Hæmorrhage. A Sequel to the Mütter Lecture for 1901. American Journal of Medical Sciences, June, 1903, Vol. CXXV, n. s., p. 1017.

band was placed near the optic foramen, around the exposed nerve, and tightened to a point just short of shutting off the central artery of the retina, this would lead to the usual ophthalmoscopic picture of stasis, but we were never able to cause an appreciable swelling of the disc or retinal œdema thereby.

Experiments of this type, therefore, showed us that *simple stasis in the retinal veins fails to produce anything more than the condition of venous engorgement which accompanies a choked disc* and never leads to a definite œdema of the papilla.

We recognize the fact that these observations are not entirely conclusive, that there are many things which deserve repetition, and that a different result might be obtained in eyes of other species than the dog. They do not serve to finally eliminate venous stasis as a primary factor in the production of choked disc, though the comparative ease with which the condition is produced by cerebrospinal fluid stasis and the difficulty with which it is produced by venous stasis indicates what in all probability is the essential element.[10]

E. Attempts were then made by observations of longer duration *to reproduce the histological alterations in the disc which characterize the long standing choked disc of tumor in man.*

Observation XVI.—April 14, 1908. A bilateral cranial defect with removal of a considerable area of bone under each temporal muscle had been made three weeks previously. At that time the dura had been opened and the pyramidal tract on each side divided for purposes of studying the resultant Wallerian changes. The patient—a medium-sized mongrel dog—had made a perfect recovery and the wounds had healed by primary union.

It was found that slight pressure exerted against the temporal muscles over the defects led to a drowsy state, without appearing to occasion any discomfort, just as is true of man when pressure is made over a large cranial defect. On continuance of the pressure for some minutes the eye-grounds, which previously were normal, showed a swelling of the discs amounting to 2 D. (comparable to experiments of the type B).

A head bandage of crinoline was applied with pads over the defects so as to keep up a moderate degree of pressure, and morphia was administered to assure us of the animal's being kept in a stuporous state.

April 15. A bilateral swelling of each disc of 3 D. was present.

April 18. Condition unchanged.

April 20. A considerable increase in the swelling on the left, with definite retinal œdema. Two small hæmorrhages following the line of the lower veins. Right eye unchanged.

May 9. No further clinical alterations have been observed in the eyes. Animal sacrificed on this day: the pressure having been continued most of the time during the period of three weeks, it was thought that permanent histological changes would be apparent in the nerve.

Autopsy.—Brain, which had been hardened in situ by carotid injections of formalin, showed considerable flattening over each parietal lobe. No unusual dislocation of cerebellum into foramen magnum was observable.

Eyes were hardened in Zencker's fluid. The optic sheaths did not seem to be especially distended.

Histological examination showed swelling of the disc and marked separation of the tissues of papilla and retina by œdema (Figs. 9 and 10). There were numerous small extravasations of blood, and beginning round-cell infiltration was apparent.

Though the changes were not particularly advanced, the evidence in the neuro-retinal structures was sufficient to show the tendency toward the profound alterations in the eyes which are found in cases of long standing pressure.

F. A number of experiments were finally made by *the introduction within the cranium of a foreign body with the object of more closely simulating the conditions present in tumor.*

The first attempts in this direction were made with melted paraffine introduced from a warmed Pravatz syringe directly into the cerebral or cerebellar substance through a small opening drilled through the bone. Though certain temporary retinal changes occurred in a few instances, particularly after some of the cerebellar injections, the neuro-retinal disturbance was but transitory and the solidified mass of paraffine was tolerated without further effect on the brain beyond that occasioned by the immediate local destruction of tissue. We appreciated, therefore, that some foreign substance which would exert a constant elastic pressure was essential, and it was found that fragments of compressed sponge-tent were admirably suited to this purpose.

Observation XX.—December 15, 1908. 2 p. m. Under ether, and with painstaking surgical precautions, the left occipital base was exposed by Dr. G. J. Heuer, and a small 6 mm. trephine opening made without dural injury. Through this opening the dura toward the mid-line was separated from the bone and four or five fragments of dry sponge-tent were introduced. The wound was then closed.

3.45 p. m. A horizontal nystagmus is present in both eyes, more marked in right than left. The fundus, which was normal before and immediately after the operation, now shows a distinct œdematous elevation of the upper part of the right disc with marked engorgement of the veins. Left eye normal.

5 p. m. No further change; nystagmus has disappeared. Patient has recovered from anæsthetic and though somewhat ataxic is lively and running about.

December 16, 3 p. m. General condition excellent. Marked venous engorgement of both eyes with œdema on the right persisting, though not increased. Pupils normal.

December 17, 3 p. m. Somewhat apathetic and unresponsive. Distinctly ataxic and unsteady when on feet. *Right Eye:* Venous engorgement with distinct swelling of entire disc. *Left Eye:* Engorgement and general haziness of disc from low grade œdema.

December 21. The condition noted above has persisted unchanged until to-day. Venous congestion much less marked in both eyes. Disturbance of gait disappearing.

[10] It should be noted in this connection that stasis such as occurs in cases of sinus thrombosis, especially of the widespread autochthonous form, is usually associated with pressure phenomena and a high grade of choked disc. Here the venous stasis, of course, plays the primary rôle, but it leads to definite pressure symptoms, doubtless with an increase in the tension of the cerebrospinal fluid around the base of the third ventricle and a consequent distension of Schwalbe's sheath. Whether this distension of the optic sheath is what leads to the stasis in the retinal veins, as some have thought, or whether the stasis is due to compression of the cavernous sinus (v. Graefe) or other outlets for the blood still nearer the heart can at present be only conjectured.

It may be noted further that we did not succeed in reproducing in the dog the choked disc of man which follows cerebral trauma, either from difference in character of intracranial circulation or because of inconsequent methods.



FIG. 2.—Section of canine nerve and retina, to show experimental choking of disc; also optic sheath distended by blue-stained fixative fluid and a certain amount of blood.



FIG. 3.—Cerebrum of patient with subtentorial tumor causing a low grade of hydrocephalus and choked discs in the atrophic stage. Brain removed after hardening in situ. Coronal section passing through interpeduncular space. Note (A) the distension of the subarachnoid spaces of this region; (B) slight widening of third ventricle; (C) optic tract; (D) oculomotor nerve.



FIG. 4.—Section through the centre of the nerve and papilla in a case of long standing choked disc accompanying cerebral tubercle; distension of Schwalbe's sheath limited to subarachnoid spaces.



FIG. 5.—Showing marked ampullaform distension of Schwalbe's sheath in a case of long standing choked disc. Note the thickened bands of the subarachnoid spaces, exposed by reflecting a window from the dural sheath.



FIG. 6.—Same eye as in Fig. 5, looking directly into fundus. Note projection of disc especially marked on nasal side, *i. e.*, away from macula. Note also tortuosity of veins.



FIG. 7.—Section of nerve and papilla from a case of acute choked disc (two weeks) in a patient who succumbed to pressure from cerebral œdema. Note ampullaform dilatation of Schwalbe's sheath, the fluid being confined to the subarachnoid spaces and leading to rupture of many of the delicate sub-arachnoidal bands.

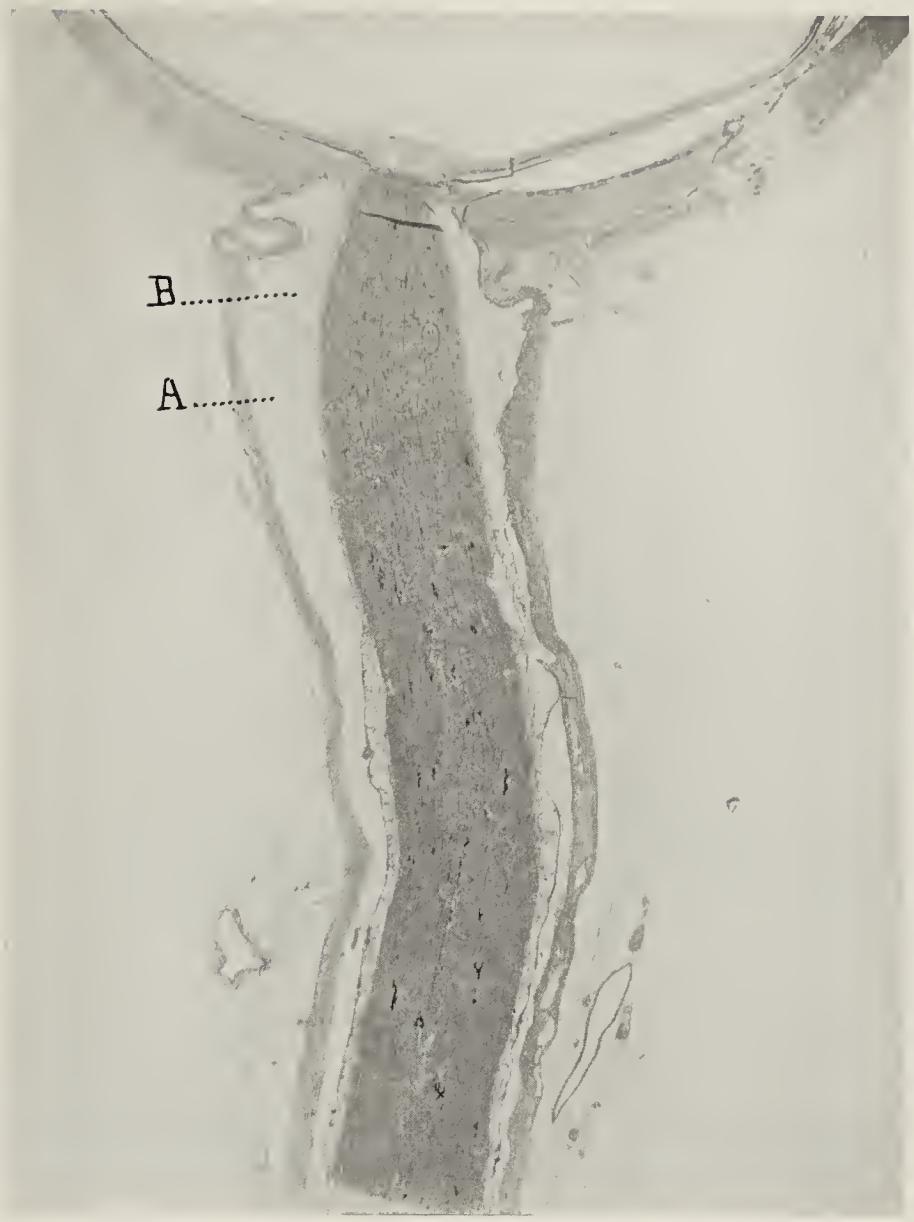


FIG. 8.—For comparison with Fig 6. Nerve and edge of disc from a similar case. Note ampullaform dilatation of sheath enfolded during fixation; distension by fluid in subdural space (A), as well as in subarachnoid spaces (B).

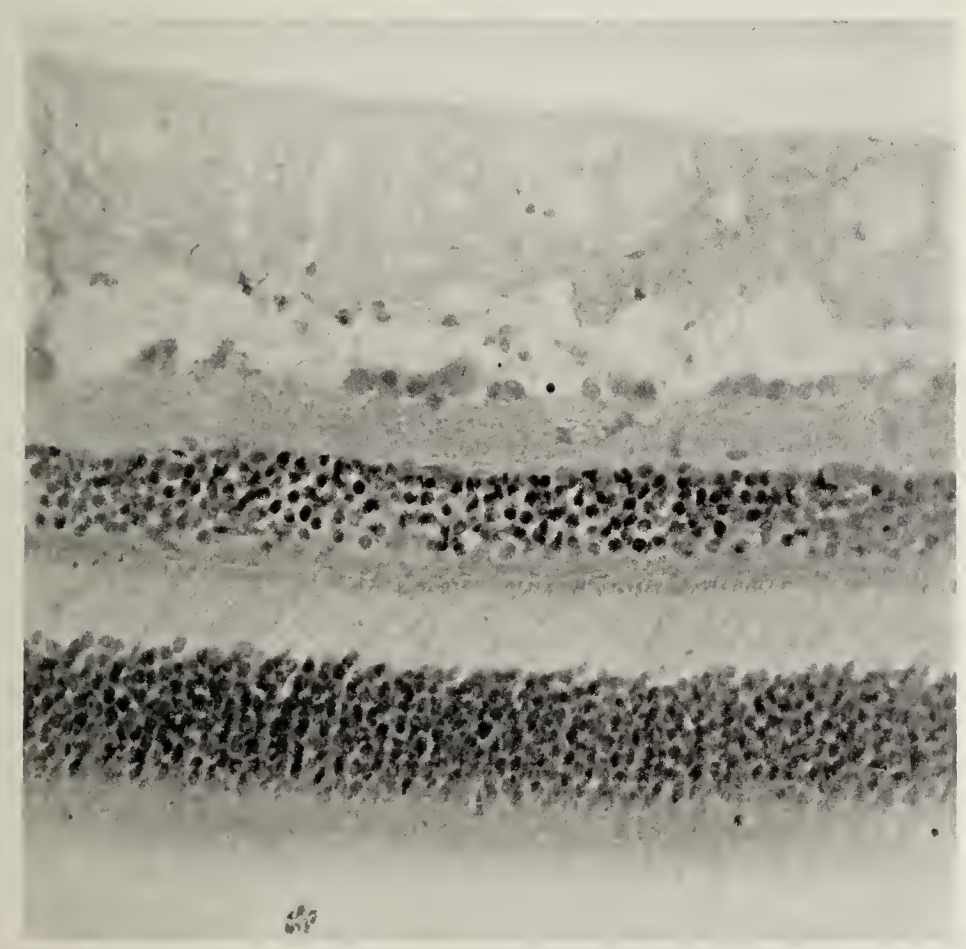


FIG. 9, *Observation XVI.*—Showing marked separation of retinal tissues by œdema, in this field practically limited to the nerve fiber layer. Note destruction of ganglion cells, as well as a marked lengthening and tortuosity of nerve fibers.

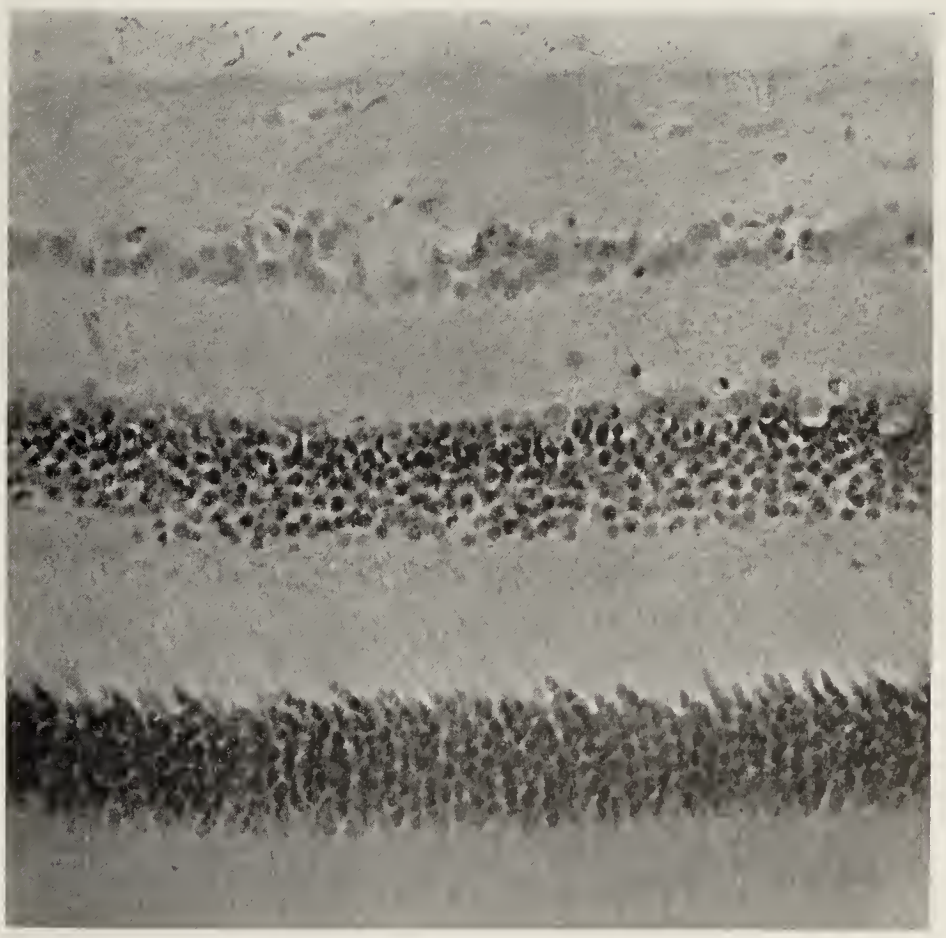


FIG. 10.—Section from a practically normal eye to contrast with Fig. 9.

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FIG. 11, *Observation XX.*—Showing position of partly organized sponge over left cerebellum (cf. Fig. 12).



FIG. 12.—Coronal section of cerebrum, *Observation XX*, showing ventricular distension from moderate grade of obstructive hydrocephalus (cf. Fig. 11).



FIG. 13.—Showing brain, optic nerve and eyeball from *Observation XXI.* Note position of partially organized sponge and distension of optic sheath.



FIG. 14.—Cross-section of brain in *Observation XXI*, to show extent of pressure dislocation exerted by the tumor-like foreign body (cf. Fig. 13).

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December 29. All evidences of neuro-retinal change have disappeared. No cerebellar symptoms. Wound has healed perfectly.

January 2. Eyes remain practically normal. Chloroformed.

Autopsy.—Brain and eyes hardened in situ. A moderate degree of compression of left cerebellum by swollen fragments of sponge (Fig. 11), which on their dural aspects are adherent in a mass and are undergoing organization. No evidence of any local infection. A low grade of internal hydrocephalus is present (Fig. 12), sufficient, one would have supposed, to perpetuate in the retina some evidence of stasis at least, but this, if present, was unobserved. No particular evidence of swelling in Schwalbe's sheath.

Observation XXI.—December 15, 1908. 4 p. m. An operation was performed similar in technique to that recorded in Observation XX, but with the introduction of larger fragments of sponge-tent between bone and dura over the left hemisphere.

5 p. m. Fifteen minutes after closure of wound. Both eyes show marked tortuosity of retinal veins with practically no change in the arteries. Pupils dilated *ad maximum*. Practically no response to light. No nystagmus. No evidence of œdema of disc.

December 16, 3 p. m. Patient made a good recovery from the anæsthetic. Has taken food and drink, and though somewhat dull, is lazily moving about. Pupils normal in size and reactions. *Right Eye:* Upper portion of disc shows marked swelling and particularly in that direction there is extreme tortuosity and distension of the veins. *Left Eye:* The entire disc is clouded and distinctly swollen; veins enormously engorged and tortuous—much more so than on the right. No hæmorrhages. No exudates.

December 17, 3 p. m. Animal still dull and stupid. Both discs have increased in height.

December 18, 3 p. m. A still further increase in the swelling of both discs. The change is still particularly marked in the left eye, where great tortuosity of the veins persists.

December 29. The condition of the eyes remains practically unaltered, though the animal has largely recovered from his stuporous state and is more lively and responsive. The wound has completely healed.

January 2. Choked disc persists, more marked on left than right. Chloroformed.

Autopsy.—Brain and eyes hardened in situ by carotid injections of 10 per cent. formalin. Area occupied by fragments of elastic tent, which by process of organization are adherent to the dura though not to the overlying skull, is shown in Fig. 13 of upper surface of brain, and on section in Fig. 14. No internal hydrocephalus. No infection. Considerable distension of Schwalbe's sheath in both eyes (Fig. 13).

Histological examination shows marked œdema of neuro-retinal tissues and beginning round-celled infiltration.

It is our intention to make further observations of this sort with the intracranial introduction of sponge-tent, particularly as it may serve to throw light on the incidence of choked disc accompanying supratentorial and infratentorial growths, especially when in the latter case there is an associated hydrocephalus. It will be readily seen from the short notes upon these two cases that there are a number of points which need further elucidation, but for the purposes of this immediate report these two observations suffice to show that without the association of any toxic or inflammatory condition, it is possible to simulate experimentally the swelling of the nerve-head and the other retinal changes which characterize at least the early stages of choked disc in human patients.

To summarize the results of these experiments it may be said:

(1) That the introduction of fluid under tension into the intracranial subdural space will produce an acute œdematous swelling of nerve-head and retina—in other words, a choked disc—which can be observed during life with the ophthalmoscope and demonstrated by a study of the tissues after death.

(2) That simple digital compression exerted against an area of the dura exposed by a trephine opening and without the introduction of new fluid under tension will produce similar lesions.

(3) That these acute œdemas of the nerve-head and retina are associated, under both conditions, with distension of the optic sheath, particularly of its subarachnoid spaces.

(4) That venous congestion does not seem capable, without the concomitant action of fluid under tension in the optic sheath, of producing more than the congestive features of choked disc; in other words, under the conditions of the experiments it failed to occasion any appreciable œdema of the nerve-head.

(5) That long-continued pressure against a dural defect can lead to retinal hæmorrhages and other clinical, as well as histological, features which characterize chronic choked disc in man.

(6) That the introduction between the skull and dura of foreign bodies which are capable of subsequent increase in size and which possess some elasticity, will closely simulate the action of a new growth, and, placed either above or below the tentorium, will lead to the production of choked disc.

It may, therefore, be stated in conclusion:

(1) That the occurrence of the neuro-retinal œdema is primarily dependent on the passage of cerebrospinal fluid under tension from the subarachnoid spaces of the interpeduncular region into the vaginal sheath of the optic nerve, and that cerebral decompression often allows the process to subside, owing to a resultant diminution of tension from release of the confined fluid.

(2) That the experimental work corroborates many of the more recent clinical observations in showing that a choked disc, even of considerable height, may be rapid in its formation and, provided it has not gone on to the stage of new tissue formation, may rapidly subside; and thus speaks strongly in favor of a mechanical, as opposed to a chemical or inflammatory origin for the lesion.

INDEX TO VOLUMES 1-16 OF BULLETIN.

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ON THE EXCRETION OF HEXAMETHYLENAMIN (UROTROPIN) IN THE CEREBROSPINAL FLUID AND ITS THERAPEUTIC VALUE IN MENINGITIS.

By S. J. Crowe, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

In a previous publication[1] dealing more particularly with the excretion of urotropin in the bile and pancreatic juice, attention was called to the fact that after ingestion urotropin also appears in the cerebrospinal fluid.

As recorded at that time, the patient on whom this observation was first made was a boy, thirteen years of age, in whom a cerebrospinal fistula had occurred after a suboccipital operation for a cerebellar tumor, in consequence of the sloughing corner of one of the skin flaps. The discharging fluid soon became purulent; the temperature ranged between 100° and 103° F.; and as a fatal meningitis is the usual outcome of infected cerebrospinal fistulas of this nature, a like result was feared in this case.

Acting on the suggestion of Dr. Cushing, that urotropin might be excreted through the cerebrospinal fluid as well as through the bile and pancreatic juice, the boy was given a 10-grain dose of urotropin by mouth, and a few hours later some of the escaping cerebrospinal fluid was collected and examined. A chemical test showed that the drug was present in considerable quantity. Accordingly the dose was increased to 30 grains a day, diluted with large quantities of water. The immediate effect was not marked, as the temperature and the character of the discharging fluid showed no decided change during the following week. But after this the temperature slowly fell to normal, and the cerebrospinal fluid, escaping through the fistula, gradually lost its purulent character and became less in amount, so that three weeks after the administration of the first dose of urotropin the patient's temperature had reached normal and the fistula had entirely closed.

The finding of urotropin in the cerebrospinal fluid in this case led us to make further investigations of the subject.

Thus in cases of chronic nephritis, brain tumor or hydrocephalus, when lumbar puncture was to be performed, the patients were given a preliminary 10- or 15-grain dose of urotropin, and the cerebrospinal fluid after removal was tested by a modification of Hehner's test.[2] In all of these cases the chemical test was positive, showing that urotropin, after its administration by mouth, invariably appears in the cerebrospinal fluid. It may be added that a number of observations were made showing that the drug may possibly be as readily absorbed after rectal administration as when given by mouth.

In some instances the urotropin was not given until the cerebrospinal fluid was dripping steadily from the needle, and, by testing specimens every few minutes, the first appearance, maximum concentration and gradual disappearance of the drug could be easily followed. These factors naturally were found to vary somewhat with the individual and with the quantity of the drug taken, but in general, after a 15-grain dose of urotropin, the maximum concentration seemed to be reached after a period of from 30 minutes to one hour. This can readily be shown by the varying intensity of the amethyst color produced by the chemical test. If, after a 15-grain dose of urotropin, cerebrospinal fluid in 10-drop amounts be collected in a series of small test tubes at intervals of 5 minutes, and the reagent mixed with each, a very faint amethyst color will appear in one of the early tubes, growing more intense in the succeeding ones, and finally fading until its complete disappearance.

To determine whether the urotropin administered in therapeutic doses, appears in the cerebrospinal fluid in amounts sufficient to be of decided bactericidal value, observations were made on its inhibiting effect on the growth of organisms inoculated in the fluid after its removal from the body. The following investigation was made of the fluid withdrawn by lumbar puncture from a patient with hydrocephalus, in whom, for certain diagnostic purposes, a long continued escape of the fluid was permitted. While the cerebrospinal fluid was dropping at a steady rate the patient was given 45 grains of urotropin by mouth. Before the administration of the drug 5 cc. of the cerebrospinal fluid had been collected in a sterile test-tube; after its administration four specimens of like amount were collected at intervals of 30 minutes. Each tube was then inoculated with one loop from a 24-hour culture of streptococcus pyogenes, and incubated at 38.5° C. Twenty-four hours later a series of agar plates were made, taking one loop from each tube of cerebrospinal fluid. The results are tabulated in Table I.

In order to study the effect of urotropin administered in artificially produced meningitis, the observations were then

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[1] On the Excretion of Hexamethylenamin in the Bile and Pancreatic Juice. The Johns Hopkins Hospital Bulletin, 1908, Vol. XIX, p. 109.

[2] This test is made as follows: To the clear cerebrospinal fluid a drop or so of milk or a very small amount of casein is added, and this mixture is stratified with an equal volume of the reagent, which is composed of 100 cc. of 99 per cent sulphuric acid and one drop of a 3 per cent ferric chloride solution. The sulphuric acid decomposes the urotropin into formaldehyde and ammonia, and a deep amethyst color develops at the juncture of the layers. If formaldehyde (urotropin) is present in too great a concentration, however, the color reaction may not occur without dilution of the fluid.

TABLE I.

Lumbar puncture 9.30 a. m. Steady flow of clear cerebrospinal fluid.

Tube No.	Time a. m.	Inoculated with	After 24 hours' incubation.	Stained smear shows	Plates (compare photographs).	Number of colonies on plates after 48 hours' incubation.
I.	9.35	1 loop streptococcus.	Very turbid.	Abundant organisms.	Agar inoculated with 1 loop and plate made.	Very thick. Estimated number, 30,000.
	9.40	Patient given urotropin gr. 45 by mouth.				
II.	10.00	1 loop streptococcus.	Turbid.	Abundant organisms.	..... Do.....	Not so thick as in No. I. Estimated number, 20,000.
III.	10.20	..... Do.....	Slightly turbid.	Scattered organisms.	..... Do.....	Estimated number, 1,000.
IV.	11.00	..... Do.....	Slightly turbid on shaking.	Very few organisms.	.... Do.....	Estimated number, 800.
V.	11.30	..... Do.....	..... Do.....	..... Do.....	..... Do.....	Estimated number, 500.

TABLE II.

Observation VIII.—Showing the effect of urotropin administered by mouth on streptococcus meningitis in dogs.

Animal No.	Inoculated with 24-hour bouillon culture of streptococcus.	First dose of urotropin given.	Amount of urotropin given during 24 hours.	Clinical course.	Autopsy findings.—Microscopic smears and cultures.
I.	0.1 cc. injected under dura.	Control. No urotropin.	None.	Died 24 hours after inoculation.	Purulent meningitis. Smears and cultures showed abundant organisms.
II.	..... Do.....	Urotropin gr. 10 1 hour after inoculation.	30 grains.	Died on 2d day after inoculation.	Purulent meningitis. Smears and cultures showed abundant organisms.
III.	.... Do.....	Urotropin gr. 15 immediately after inoculation. Animal still under anaesthetic.	45 grains.	Died on 2d day after inoculation.	Purulent meningitis. Smears and cultures showed abundant organisms.
IV.	..... Do.....	First dose of urotropin (20 gr.) given 12 hours before inoculation, and repeated every 4 hours.	80 grains.	2d day—Very sick; refuses to eat; slight rigidity of neck and legs. 3d day—Much better; drank some milk. 4th day—Improving steadily; rigidity much less marked. 5th day—Continues to improve; given 2 to 3 liters of water a day with stomach tube. Continues to improve; apparently well. General neuritis suddenly developed on 15th day, and animal was sacrificed.	Cerebrospinal fluid clear; slight thickening and cloudiness of membranes around base; smears showed no organisms; cultures sterile.

transferred to animals, the first few experiments being conducted on rabbits.

A very virulent organism was obtained by lumbar puncture from a patient who succumbed to a streptococcus meningitis. This organism was used throughout the entire series of experiments, its virulence being retained by its occasional passage through a rat. Only five observations were made on rabbits, of which the following will serve as a type:

Two animals of about the same size and weight were selected, and a small hypodermic needle was introduced into the lumbar subdural space of each. After obtaining a drop or two of cerebrospinal fluid, an equal amount of a bouillon culture of the organism was injected and the needle withdrawn. By means of a stomach tube 10 grains of urotropin was given to one of these animals immediately following the inoculation, and the dose was repeated at intervals of four hours. The other animal served as the control, receiving no urotropin.

Due to the virulent strain of the organism used and the great susceptibility of these animals to infection, both the inoculated animal and the control rapidly succumbed to a purulent meningitis. The animals receiving urotropin usually died on the third or fourth day, but the control animals invariably succumbed in less than 36 hours after the inoculation. The clinical symptoms, such as retraction of the neck and general muscular rigidity, were equally marked in both, but their onset was distinctly deferred in the animal receiving urotropin. The autopsy findings were identical; cultures and smears from the purulent cerebrospinal fluid showed an equal number of organisms in both animals.

Similar observations were then attempted on dogs, but owing to the great difficulty of making lumbar punctures on these animals it was necessary to resort to an operative exposure of the meninges. A number of experiments were made, the general results of which can be illustrated by a single series. Four animals, all perfectly healthy and of about the same size and weight, were selected. Under ether anæsthesia and with painstaking surgical precautions, they were serially inoculated in the following manner:

The back of the head and neck was shaved and the skin cleaned with alcohol, ether and bichloride. A median incision, about 10 cm. in length, was made tailwards from the external occipital protuberance. The muscles were separated, exposing the prominent spine or comb of the second cervical vertebra which, projecting upward, overlies the broad posterior arch of the atlas. On removing the upper two-thirds of this spine and strongly flexing the animal's head a small trephine opening was readily made in the posterior arch of the atlas. The dura was thus exposed without injury, and by means of a curved hypodermic needle and an aspirating syringe, cerebrospinal fluid could be withdrawn or organisms introduced into the subdural space with but little subsequent leakage or chance of infection of external tissues. (The external wound was never found infected.) The muscles and skin were then closed by interrupted stitches of black silk.

Each of the four animals mentioned above were inoculated with an equal amount of bouillon culture of streptococcus. One served as a control, the three others receiving urotropin under varying conditions and in varying amounts. The results are presented in tabular form in Table II.

All four of these animals, therefore, were inoculated with an equal amount of a very virulent culture of streptococcus, and although the second animal was given urotropin, the first dose was not administered until one hour after the inoculation had been made. The third animal was given the first dose immediately after the inoculation but while still under the anæsthetic. Both of these animals (II and III) lived but a short time longer than the control, and the postmortem findings and cultures were in every way similar in all three cases. Subsequent observations have shown that but very little urotropin is absorbed from the stomach of an anæsthetized animal, so that it was probably some time before the drug reached the acutely infected fluid. The fourth animal, as can be seen, made an apparently complete recovery, but was sacrificed, owing to the onset of symptoms of a painful neuritis; the autopsy showed the meninges to be sterile, and there were but slight traces evidencing past infection.

Although we have no accurate method of quantitatively testing the fluids for the amount of urotropin present, the impression has been gained, from the comparative color tests of cerebrospinal fluid and urine in these animals with an infective meningitis, that a larger amount of the drug appears in the cerebrospinal fluid under these circumstances than in the urine, where, under normal conditions, the greatest amount is found. If this prove to be true it would suggest that some selective action may occur, possibly through the agency of the leucocytes, which have the power of taking up the drug, as Vindevagal [3] has shown by an examination of these cells washed free of serum.

Only a few of the forty experimental observations which we have made have been cited in this report, but they serve to illustrate that animals that have received several doses of urotropin before the cerebrospinal space has been inoculated with pathogenic organisms will, even if recovery does not actually take place, survive longer than animals that have received the urotropin after the inoculation, and much longer than those to whom none of the drug has been administered. It has been our impression that, in case the first dose of urotropin was given subsequent to the inoculation, the progress of the infection was merely held in abeyance during the continuance of subsequent active therapy, and that as soon as the drug was withdrawn the organisms immediately began to multiply with a return of clinical symptoms. This is much the same experience that has long been had with urotropin administered in genito-urinary infections, and it is also akin to our experiences with the drug in infections of the biliary tract. It would seem, therefore, that the most marked therapeutic value of the drug would be for prophylaxis or at least for cases of early infection.

During the past year it has become a routine measure in the Johns Hopkins Hospital to promptly administer urotropin to all patients with lesions that not infrequently are followed by infection of the meninges; and owing to the complete absence of such a complication in quite an extensive series of cases, the prophylactic importance of the drug seems fairly well demonstrated. This series includes a number of instances of compound fracture of the skull, of gunshot wounds of the head, and of patients with cerebrospinal fistulæ, under the daily administration of from 30 to 60 grains of urotropin. Its use has also been further extended as a preliminary to the performance of ventricular or lumbar puncture, in case the local conditions are such as to make possible the inoculation of the meninges with organisms from an infected skin; in the same way the preliminary taking of urotropin is desirable before a first catheterization or one necessitated in the presence of an urethral infection. It is possible, too, that the drug might wisely be used in cases of extracranial infection when extension to the meninges is feared, as in infected wounds of the scalp, otitis media, or suppurations of the cranial sinuses. Its administration might further be desirable in elaborate spinal or cerebral operations, in view of the possible, though fortunately rare, slips in aseptic technique which may occur in these cases.

Summary.

(1) Urotropin, when given by mouth, invariably appears in the cerebrospinal fluid. This fact has been demonstrated by a large number of observations on man, and is also true for dogs and rabbits.

(2) The largest amount of urotropin is present in the

[3] Annales de la société royale des sciences médicales de Bruxelles, 1902, Vol. II.

PHOTOGRAPHS OF PLATES I, III, IV AND V, DESCRIBED IN TABLE I.



Fig. 1, Plate I.—Showing innumerable minute colonies; estimated number 30,000. Result of inoculation of fluid removed before urotropin was given.



FIG. 2, Plate III.—Showing many larger colonies, though total number only about 1000. Result of inoculation of fluid removed forty minutes after urotropin.



Fig. 3, Plate IV.—Estimated number of colonies, 800. Result in fluid removed one hour and twenty minutes after inoculation.



Fig. 4, Plate V.—Approximately 500 colonies. Result in fluid removed one hour and fifty minutes after inoculation.

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cerebrospinal fluid from 30 minutes to an hour after the ingestion of the drug.

(3) After doses of urotropin, within therapeutic limits, a sufficient amount of the drug appears in the cerebrospinal fluid to exercise a decided inhibitory effect on the growth of organisms inoculated into this fluid after its removal from the body.

(4) Following a subdural inoculation of dogs and rabbits with streptococcus, 60 to 80 gains of urotropin a day, given under conditions which insure absorption, will markedly defer, and in some cases prevent, the onset of a fatal meningitis.

(5) In view of these observations, the prompt administration of urotropin is advised in all clinical cases in which meningitis is a possible or threatened complication, or even when meningeal infection has actually occurred.

IS THE PITUITARY GLAND ESSENTIAL TO THE MAINTENANCE OF LIFE?[1]

By Lewis L. Reford, M. D., and Harvey Cushing, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

Of late years the symptom-complex of a number of maladies which are frequently associated with tumors or hypertrophies of the pituitary gland has become fairly well determined, this being particularly true of acromegaly, of gigantism, and of what is known in Austria as Frölich's disease—a condition characterized by sexual infantalism and an increase of panniculus. When the altered configuration of the pituitary fossa due to the glandular enlargement can be objectively demonstrated by a radiogram, the existence of the concomitant hypophyseal lesion can be assured.

In addition to the peculiar constitutional disturbances which accompany many of these hypophyseal growths, they are frequently the occasion of great physical suffering, owing to distension by the enlarging gland of its dural encasement; and, furthermore, since they compress the optic tracts and chiasm, they are a usual source of primary optic atrophy.

Largely for palliative reasons, therefore—to check the progressive blindness and to alleviate the headache—operations have been undertaken with the aim of removing the enlarged hypophysis, and several recorded and more unrecorded efforts at extirpation have been made, particularly in London and Vienna, with what has been regarded as a promising measure of success.

However, if we are to profit from the experiences of the earlier operations for goitre undertaken when the physiology of the thyroid and parathyroids was but little understood, it seems premature to undertake operations upon man, at least such operations as have extirpation for their object, before we have some more definite knowledge of the effect upon the body of total hypophysectomy.

Physiologists can attack the problem of the function of a ductless gland in two ways, one to ascertain the effects of injection of the material which it secretes, and the other to study the symptoms which result from its total or partial removal. Although elaborate studies have been made upon the morphology and physiology of the gland, the only striking series of successful extirpations have been those recently recorded by Paulesco,[2] and it has been our aim to test the truth of his assertion, which is contrary to that of many previous investigators, and has been questioned by some later ones[3] that total extirpation of the gland is incompatible with the prolongation of life.

The approach to the sella turcica by experimentalists and by surgeons has been undertaken in a number of different ways. Intracranial routes of access are to be had either by way of the anterior cerebral fossa from in front after elevating the frontal lobes, or by the middle cerebral fossa from the side under the temporal lobe. The extracranial or transphenoidal routes through the nasal, buccal or maxillary cavities, after opening the sphenoidal cells, approach the gland at the base of the skull from below. With the exception of Horsley's unpublished series of cases by the temporal route, all of the successful operations on man thus far recorded have been carried out by the transphenoidal method and seemingly have been only partial extirpations, which may possibly account for their therapeutic success in a number of instances. This has been most striking in the case of acromegaly, operated upon by Hochenegg, the performance being comparable in a measure to a partial thyroidectomy for Graves' disease.

Without entering into a discussion of what will come to be the preferable method of approach to the gland in man, the transphenoidal method for experimental purposes possesses obvious objections, on anatomical grounds, as well as for reasons relating to sepsis. Hence, in our operations, we have been led to accept Paulesco's method, which possesses, at least for experimental canine hypophysectomies, certain unquestioned advantages; for the bilateral cranial opening brings into play the principle of cerebral dislocation of importance in many cerebral operations on man, and this permits of such a degree of elevation of the brain that the hypophysis can be brought clearly into view from the side with but little danger

[1] Read before the American Physiological Society, Baltimore, December 30, 1908.

[2] N. C. Paulesco: Recherches sur la physiologie de l'hypophyse du cerveau. L'hypophysectomie et ses effets. Jour. de Phys. et de Path. générale, 1907, No. 9, p. 441. Also L'hypophyse du cerveau., Paris, 1908.

[3] Gemelli: Biophysikalisches Centralblatt, 1908, III, p. 594.

of injury to the cerebral substance and without risk of compression symptoms.

The procedure which we adopted differs in detail rather than in principle from that of Paulesco, and it has been our aim in this first series of experiments to limit our studies to the effects of total canine hypophysectomy alone, reserving for a subsequent occasion the results of partial extirpations limited to one or another of the anatomical subdivisions of the gland.

The operations have been performed under ether anæsthesia with a preliminary injection of morphia. The animal is placed in the ventral position with a head-rest under the jaws. In order to depress the coronoid process to obtain a direct view of the gland it may be necessary later on to separate the jaws by a gag. The tips of the ears are held together under the throat. The scalp is shaved and prepared and the operative field enclosed with sterile towels with the usual operative precautions. It is well to pin the towels directly into the tissues to prevent their slipping away from the small field of exposure.

A mid-longitudinal incision is made through scalp and aponeurosis from between the superciliary ridges to a point back of the occipital protuberance. After reflecting these superficial coverings the temporal fascia and muscle on each side are divided down to the bone in a line concentric with their attachment and about ½ cm. from the insertion, so as to leave an upper margin sufficient for subsequent reunion. This incision should extend from the orbit back and downward to the posterior end of the zygomatic arch. The muscle on each side is then separated from the cranial vault with a periosteal elevator as low as the zygomatic level and retracted to each side.

We have chosen the left side of the head as the most convenient for exposure of the gland, and consequently the treatment of the two sides of the cranium as well as of the dura differs somewhat in consequence of this. On the side of the approach (left) the zygoma is bared by crowding the tissues forward from its temporal attachment and the arch is resected and excised, as in the usual operative approach to the Gasserian ganglion in man. On the opposite side (right) zygomatic resection is not necessary. Primary openings are then made in the skull with a large trephine, removing a button of bone from the most accessible part—the parietal eminence—of each exposed field. These primary openings are further enlarged with rongeurs, so as to expose a large part of each hemisphere and on the side of proposed approach to the gland (left) the removal of bone is carried well down so as to include the cranial base.

A crescentic incision is then made in the dura on the right side, leaving an opening through which the right hemisphere will be readily dislocated during the necessary subsequent elevation of the left hemisphere in the approach to the gland. The temporal muscle is then loosely replaced over this right hemisphere and the remainder of the operation is carried out entirely on the left side.

Here upon the left we have deviated somewhat from Paulesco's procedure, in making only a small linear opening in the dura as near the basal median line as possible. The opening of the membrane must be made without injury to the overlying brain in order to obviate any obscuration of the field through bleeding from such an accident. Thus the dura under the temporal lobe is gradually elevated, much as in the usual ganglion operation, until the zone of dense attachment of the membrane at the base is reached. The dura just external to this zone is caught up by a small sharp hook and a pin-hole opening made; through this a special cutting hook with a guarded point is inserted, and a linear incision about 1.5 to 2 cm. in length is made across the direction of approach. Through this incision a specially constructed spatula is passed, and the naked temporal lobe, supported by a flattened pledget of cotton, is elevated, giving a ready and free exposure of the pituitary region. A larger incision in the dura is unnecessary and is apt to be the cause of trouble during the subsequent manipulations, in case the cortex should protrude sufficiently through it to cause rupture of the pia-arachnoid with resultant bleeding which quickly obscures the operative field. Furthermore, the preservation of the dura well down beneath the temporal lobe is the greatest source of protection for the cortex during the process of elevation.

Careful swabbing with pledgets of cotton will remove the excess of cerebrospinal fluid, and an excellent view of the pituitary gland just above the third nerve and behind the carotid artery is obtained. The third nerve is an excellent landmark, but the gland itself in any case is easily recognized from its unmistakable reddish color. Occasionally the third nerve is divided and it almost invariably is injured to a degree sufficient to cause a subsequent dilatation of the pupil.

By careful manipulations with delicate blunt-edged spoons it is usually possible, after experience has been gained, to liberate the hypophysis with but slight bleeding, and such extravasation of blood as does occur can almost always be quickly stopped by the temporary insertion of cotton pledgets. In spite of its deep position and vascular attachment, the posterior lobe, possibly owing to its somewhat firmer structure, has been found to be the portion of the gland most easily freed, and occasionally it has been dislocated out of its pocket in the anterior lobe before the entire gland could be removed. We have endeavored, however, to remove the entire gland intact and have succeeded in this endeavor in about half of the twenty cases. In others the gland has been fragmented and has been removed in pieces.

Unless there is some accidental injury to one of the carotid vessels or to the surrounding venous sinuses, the amount of hæmorrhage is surprisingly slight, and after the removal of the gland following the separation of its stalk from the infundibulum it is possible to withdraw from the operative field, leaving it dry and clean and with but little retained blood-clot, as has been evident from the subsequent post-mortem examinations.

The closure of the dura is unnecessary, the temporal

muscles, fascia aponeurosis and skin alone being accurately approximated with fine interrupted sutures. It has been our custom to apply a starched head bandage, to protect the patient from the chance injury of bumping its head while in the ataxic stage of recovery from the anæsthetic. The duration of the operation was usually from two to two and a half hours.

Out of twenty operations five were unsuccessful and, owing either to hæmorrhage which prevented a clean extirpation, or to complications from the ether, these animals died during the operation or were sacrificed before recovery from the anæsthetic. Of the remaining fifteen the majority regained consciousness with the usual promptness and within a few hours were able to get on their feet and walk unsteadily about the room. Within six hours they would drink the water and milk which was sparingly given, and often by the following day they would take solid food, in spite of the recent division of the temporal muscles. Dilatation of the pupil from the third nerve injury was usual on the side of the operation, though this, in a number of cases, passed away by the second day.

Though less active and responsive than after other operations, intracranial or otherwise, nevertheless on the day after the hypophysectomy when at their best they would walk about, eat and drink, and returning to their cages, would rearrange their beds and behave otherwise in a natural way. At this time in the average case the temperature, pulse and respiration would be practically normal. After some hours, however, usually before the second day and occasionally indeed from the time of operation, they would become lethargic, sleeping heavily, paying no attention to comforts of bedding or heaters, and indifferent to the soiling from evacuations. From this condition they would pass into a comatose state with a striking incurvation of the spine, a slow respiration with a long-drawn inspiratory act, a feeble pulse, a perfectly limp musculature and often a subnormal temperature. In one case the rectal temperature before death fell to 25° C. The transition from this deep coma to death was almost imperceptible and unattended by a struggle of any kind. The conjunctival, skin and tendon reflexes were usually retained to the end.

Deviations from this typical course of events occurred in some cases. The lethargic state in some of the animals set in earlier and in a few (four) instances was postponed for four days, once as long as a week. Occasionally, owing we supposed to injury of the pyramidal tract from undue elevation of the temporal lobe (for the fibers of the corona radiata pass, in the canine, quite near the lower surface in their course from the motor cortex to the capsule), the animals showed on the day after operation a rotary progression similar to that seen after unilateral extirpation of the motor field. Fibrillary contractions, trembling and twitching occurred in some instances.

The subcutaneous administration of an infusion of a newly removed canine hypophysis was followed by no appreciable change in the animal's condition on the few occasions when this was carried out.

Postmortem examinations were held on all of the animals without disclosing any adequate cause of death. In a number of instances slight injury of the temporal lobe on the side of approach was observed, but in no case had there been any postoperative extravasation which could have accounted for the fatalities. The sella turcica was found to be completely free from macroscopical evidence of glandular substance. No sections were cut of the tip of the infundibulum, where possibly there may have remained portions of the "pars intermedia" (Hering) which may have accounted for the prolongation of life in the five instances in which the characteristic lethargic state set in later than the first day or two after the hypophysectomy.

In conclusion, we feel that the results of these observations sustain Paulesco's contention that a total hypophysectomy is imcompatible with the continuance of life, although its average duration in our series of typical extirpations has been somewhat longer than that observed in his series of cases. It is a further contention of Paulesco's that the mere separation of the hypophyseal stalk from the infundibulum is equivalent to a total extirpation, and if this is the case it must be a further check upon the attempts at total extirpation, in man, particularly when conducted by the intracranial temporal route, when an accident of this kind is likely to occur.

It is to be inferred from these experimental observations that the surgery of the hypophysis must be limited either to the removal of tumors which may implicate the pituitary gland, or in case of hypertrophy, to a partial hypophysectomy.

EXPERIMENTAL SURGERY OF THE MITRAL VALVE.

By B. M. Bernheim, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

The question having been raised by Sir Lauder Brunton,[1] Can a mitral stenosis be transformed by surgical measures into an insufficiency with benefit to the patient? we have undertaken experimentally to produce and subsequently to relieve such a stenosis. Certain observations with this end in view have already been recorded,[2] and it is my purpose to report further progress, with especial reference to the opera-

[1] Preliminary Note on the Possibility of Treating Mitral Stenosis by Surgical Methods. The Lancet (London), 1902, Vol. I, p. 362.

[2] Cushing and Branch: Experimental and Clinical Notes on Chronic Valvular Lesions in the Dog, etc. Journ. of Med. Research, 1908, Vol. XVII, p. 471.

tive methods which have been used in the attempt to narrow the left auriculo-ventricular orifice; for of all valvular lesions we have found this the most difficult to reproduce.

It may be stated at the outset that though we have been able on numerous occasions to constrict the mitral ring by a suture, and have succeeded in some of these patients in subsequently dividing the constriction, we have not as yet been able to reproduce the typical presystolic murmur or the usual symptoms characterizing the "button-hole" stenosis in man. Hence the question of possible symptomatic benefit from the procedure still remains unanswered, for the lesions that have been made though productive of "murmurs" have merely led to a degree of stenosis to which the heart promptly accommodated itself.

It is necessary to recall that the canine heart, unlike the human, does not lie in contact with the overlying chest wall, and consequently must be approached through the open pleural cavity. Some form of artificial respiration consequently must be employed after the thorax has been opened, and of the two methods which we have used for this purpose—the Brauer positive-pressure apparatus and the simple direct filling of the lungs by means of tracheal canula and bellows—the latter has been found preferable. The tracheotomy is acknowledged to be an objectionable feature and might well be replaced by some form of intubation, but we have never seen any complications follow the immediate closure of the cervical wound after the operation, and other advantages of the method outweigh the uncertainties of the more elaborate positive-pressure apparatus.

Under anæsthesia the trachea is opened between two of the cartilagenous rings by a transverse incision; a large canula is secured after insertion by a tape encircling the trachea, and narcosis is continued by the aid of a Wolff bottle interposed in the tube through which artificial respiration is to be carried on after the chest has been opened.

The approach to the heart has been made as follows: Under the reflected left pectoral muscle about $3\frac{1}{2}$ inches of the exposed fourth or fifth rib with the adjoining costal cartilage is subperiosteally resected. Through the periosteal bed thus left the pleura is incised and the exposed pericardium picked up and divided from apex to base, the edges of the divided membrane being held apart by clamps. If the animal is turned at this time upon its right side the left auricle and ventricle will be uppermost and consequently in the most accessible position for placement of the suture, as will subsequently be described. When the valvular lesion has been made and the heart auscultated, all bleeding having been controlled, the incised pericardium is united, partially or entirely, depending upon conditions, and then, step by step, the pleura, muscular layers, fascia and skin are closed. Artificial respiration, instituted the moment the thoracic cavity was opened, may be discontinued as soon as the chest is again made air tight, and usually spontaneous breathing will be resumed promptly. The wound in the trachea and neck as well as that in the chest is closed without drainage.

The chief difficulties encountered during this long operative procedure are those occasioned by the passage of the cardiac ligature, and, as might be expected, hæmorrhage, either from the wounding of a coronary vessel or from tearing of the cardiac muscle, stands first as the most troublesome and serious. In our early experiments we simply used a single ligature of heavy silk or of linen (Pagenstecher), threaded on a large, round, blunted, curved needle; this was passed and tied so as to gather up a segment of the auriculo-ventricular ring. A particular form of curved needle was devised, having an eye and a fixed handle resembling that of an aneurism needle, and it was found that in this way the tip of the needle could be introduced and made to emerge at the desired points with greater accuracy and security than when a free needle was held in the fingers or in a needle holder. When satisfactorily placed, the ligature was simply tied around the outer wall of the heart with a degree of tension thought to be sufficient to produce the desired lesion. It was soon found that ligation in this way served to cut off the circulation in the superficial vessels covered by the suture with the consequent production oftentimes of an infarct.

To avoid this complication, in a number of cases two separate ligatures were passed through the ring parallel to each other about a centimeter apart; these ligatures were then tied posteriorly and anteriorly in the form of a mattress suture. Complications from this manner of procedure led to further problems. In the first place, unless each ligature was doubled it was found that there was a tendency for it to cut deeply into the muscle at the knots—in fact one suture did actually cut through the thick left ventricular wall within four days. Furthermore, the placing of the double sutures seemed to increase the chances of thrombosis formation, owing to the large amount of foreign material in the cardiac cavity; hence in the more recent and successful experiments we returned to the original method of placing a circular ligature, with the important modification that before tying, the ligature was dipped under the chief coronary vessels, and in this way complications have been completely avoided.

During the course of our studies thirty attempts to produce mitral stenosis have been made; of these thirty animals two or three succumbed promptly of shock or postoperative hæmorrhage before recovering from the anæsthetic; a number of them died from empyema; a few at a later period in consequence of thrombosis formation; ten of them recovered and were allowed to live from a week to three or four months.

It is well known that the pleura of the dog as well as of man is much less resistant to infection than other serous surfaces, notably the peritoneum, and although we observed the strictest aseptic precautions, a number of the animals succumbed within three or four days to infection after an early promise of making a complete recovery. Complications from thrombus formation have been numerous, though less frequent than infection. The heavy linen threads, which were first used for the reason that they seemed to be less liable to cut through the muscle than silk, were given up because in each animal

that lived for any length of time a thrombus was found to have formed around the suture. In one or two that survived only twenty-four hours thrombus formation was found to have already begun. In the hope of avoiding this complication the ligatures were dipped in vaseline before being passed, and on some occasions were coated with surgeon's wax, but the objections to this material have not been entirely overcome by these devices. We have thought that silver wire might possibly be less likely to lead to thrombus formation, but owing to the difficulties of passing it and of preventing hæmorrhage from its points of entry and emergence, as well as from the certainty that, owing to its complete inelasticity, it would cut through the musculature even more promptly than would silk or linen, the idea was abandoned. We have thought that an elastic ligature of some form might possibly be made available, and might possess definite advantages, but we have not as yet attempted to produce stenosis in this way.

One must learn by experience the degree of tension to be put upon the ligature in tying it. We have usually been guided by two signs—the distension of the left auricle, and the cardiac rhythm. The heart usually becomes slowed during the tightening of the ligature, and if it is drawn too tight the beat ceases entirely, becoming first irregular, then with longer and longer intervals between the beats until there is a final cessation. This whole phenomenon is often marked by the independence of auricular and ventricular pulsation.

So far as our experience goes, it matters little whether the ligature be originally placed or tied during systole or diastole —a point formerly thought to be of great importance in suturing cardiac wounds. We have frequently observed, however, that a heart which is beating too rapidly—in other words, one which is "racing"—may often become steadied, slowed, and made to beat more regularly by the passage of the ligature—a phenomenon for which we can offer no explanation. On the other hand, marked irregularity may be caused by the mere resting of the point of an instrument, such as one of pericardial clamps, even lightly against the heart. But the one thing that seems to interfere with the regularity of cardiac action more than any other is the presence of blood in the pericardium; no matter how small the amount it will immediately cause an irregularity and quickening in the beat. This seems to be due to the viscosity of the blood and the mechanical obstruction which it offers to complete diastole. On this account, and also because the blood in clotting offers resistance to the beat, the precaution should be taken, after all hæmorrhage has been controlled, thoroughly to sponge out all blood clots and then gently to flush the pericardial cavity and the outer surface of the heart with warm salt solution. Though we have not practiced it, we have considered the advisability of putting a few drops of a very light sterile oil in the pericardium to act in the capacity of the usual pericardial fluid, thinking that thereby the formation of adhesions might be prevented.

The question of closure of the pericardium has occupied our attention from the start. A certain amount of dilatation of the right ventricle is commonly seen early in these experiments, due probably to the ether and artificial respiration. As the operation proceeds, owing to the manipulations of the heart necessary for the passage of the ligature, this gradually increases and at times may become extreme. Under these circumstances it has seemed unwise to completely reunite the pericardial incision; hence it has been closed in some instances in part only, and in others it has been left entirely open with no untoward results. It is doubtful whether complete closure should ever be made, not only in view of the possible post-operative occurrence of a little bleeding, which, with an open pericardium, would cause little trouble but also on account of this distension of the right ventricle. In fact, this has suggested the idea that it might be of therapeutic benefit to open the pericardium of certain patients who have become bed-ridden from chronic myocarditis, with the object of relieving the excessive pressure and of allowing more room for the overburdened and dilated heart.

We have frequently been compelled to place one or more sutures in the cardiac wall to control hæmorrhage. On one occasion bleeding from the left auricle, the appendage of which had been picked up by a mouse-toothed forceps and accidentally torn, was easily checked by a mattress suture. Furthermore, in several instances, during the passage of the stenosing ligature a superficial blood-vessel has been wounded, causing severe hæmorrhage and necessitating ligation. In one case, on withdrawing the needle after passing the suture, the mistake was made of not considering its curve, with the result that a jagged tear was made in the anterior cardiac wall. A huge stream of blood was pumped out of the ventricle with every beat, rapidly filling the pericardium and completely obscuring the heart. The wound was controlled by digital pressure until the blood could be sponged out of the pericardium, and three sutures of heavy silk threaded on curved needles passed and tied. In our haste the attempt was made to pass one of these sutures on a straight needle, which was promptly broken in half by the muscular contraction of systole, and the ends had to be left sticking in the cardiac wall until complete closure of the wound was effected, when they were found and extracted. By this time very great dilatation of the right ventricle and auricle had taken place, so that it would have been impossible as well as fatal to close the pericardium. It was therefore left entirely open and the animal lived apparently in perfect health.

As yet, in only one of our cases of experimental stenosis have we successfully operated for its relief, with a perfect recovery; the attempt in a second case was interrupted by a fatal accident in giving the artificial respiration; and one of our most valuable and promising animals was inadvertently used for another purpose some months after the primary operation.

The method of changing the experimental stenosis into an insufficiency needs no especial description. The procedure in general differs from the operation we have described only in the treatment of the heart. For when this has been for the second time exposed by the thoracotomy, MacCallum's cutting

hook (valvulatome) is slipped into the apex of the left ventricle between the arms of an untied mattress suture; the stenosing ligature is cut and the hook withdrawn; then the suture is immediately tied, thus effectually closing the punctured wound of entrance. The treatment of the heart, therefore, is the same as that employed in the production of a primary experimental mitral insufficiency.

This procedure is far easier to carry out than the original stenosing operation; it takes less time; the hæmorrhage is easily and accurately controlled; and the operative mortality is low. This is a point in favor of the future possible operation on man according to Brunton's suggestion, and it is encouraging to think that in the event of such an undertaking, although we shall have to deal with a diseased and overburdened heart, the procedure offers no greater technical difficulties than numbers of others which are in daily practice.

I wish to thank Dr. Emil Goettsch for his assistance in many of these operations.

HYDROCEPHALUS TREATED BY DRAINAGE INTO A VEIN OF THE NECK.

By R. D. McClure, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

The successful treatment of so-called idiopathic hydrocephalus offers a surgical problem, for the solution of which no eminently satisfactory method has as yet been evolved. Though a condition of ventricular hydrops may unquestionably be brought about by a number of different lesions situated at divers places, nevertheless, the essential demand in all cases is to provide for the continuous escape of the obstructed fluid by the establishment of some new channel of outlet.

In the past, many operations have been devised with this end in view. Mere tapping of the ventricles was resorted to at first. This procedure is simple of execution when carried out as is usual through the fontanelle; rather than by the more hazardous approach through the nares, the roof of the orbit or the mouth as some have advocated. Only temporary relief, however, is thus afforded, for in the majority of cases the fluid quickly reaccumulates, often, unfortunately, with a greater degree of tension than before.

The next attempts were directed toward the establishment of permanent drainage. Following the lead of W. W. Keen a number of surgeons have endeavored to accomplish this by making a communication in one way or another between the cavity of the ventricle and the subarachnoid space. Even a successful effort of this kind we now know would not necessarily allow the fluid to escape from the cranial chamber, for in many cases the ventricular cavities and the subarachnoid spaces already communicate, and when this is so the operation at the best merely serves to transfer an internal into an external hydrocephalus, without lessening the amount or tension of the fluid which the cranium holds.

Following the suggestions of Senn, who made use of small tubes inserted through the dura in such a way that they might drain the subarachnoid spaces into the subaponeurotic layer of the scalp, a number of operations upon these lines have been performed at various hands. It has been, however, the unfortunate experience of all who have experimented upon these lines to find that the tubes invariably become occluded with brain tissue, and furthermore that the fluid is not readily taken up by the dense extracranial tissues.

It has been found that in a considerable percentage of hydrocephalic infants it is possible to largely empty the ventricles by lumbar puncture. Thus Cushing [1] records that out of a series of thirty cases of hydrocephalus it was possible in most of them to withdraw fluid from the ventricles by way of the lumbar meninges, showing that the foramina of outlet in the neighborhood of the fourth ventricle may still be patent and yet an obstructive hydrocephalus exist.

On these grounds Quincke, Wynter, and Cushing have each attempted to establish a means of escape for the fluid in the lumbar region. Quincke, after performing a lumbar puncture, blindly inserted a scalpel along the course of the needle into the subdural space, in the hope that the fluid would escape along this pathway into the lumbar tissues. A more open method has been advocated by Wynter, who first performs a laparotomy and then opens the spinal sac from the side in the hope of securing drainage into the lumbar muscles. In those cases in which it was possible to demonstrate the existence of a communication between the ventricles and the subdural space Cushing undertook to establish an outlet for the fluid into the retroperitoneal tissues. In this operation the body of the fifth lumbar vertebra, below the bifurcation of the vessels, is penetrated with a small specially constructed trephine, the anterior half of an interlocking silver canula being inserted in the opening; then, after a median laminectomy and separation of the strands of the cauda equina, the posterior half of the canula is locked in place from behind. The escape of fluid first takes place into the abdominal cavity, but as the freely movable peritoneum easily slips over the abdominal opening of the canula the fluid ultimately escapes into the loose retroperitoneal tissues. The procedure seems particularly applicable to cases in which hydrocephalus accompanies a spina bifida. The operation though delicate and difficult has met with a considerable degree of success.

Krause [2] has more recently attempted to drain directly from

[1] Hydrocephalus. Keen's System of Surgery, 1908, Vol. III, p. 123.

[2] F. Krause: Subkutane Dauerdrainage der Hirnventrikel bei Hydrocephalus. Zentralbl. f. Chir., Aug. 29, 1908, No. 35, p. 61.

the cavity of the ventricle into the subcutaneous tissues of the scalp. A silver tube is inserted through the cortex into the ventricle and is held in place by a flange at its outer end which is secured between the external table of bone and the overlying tissues. In several patients the tube has been left in place for several months. Krause reports a number of cases with favorable results, though none of them have been of very long standing.

Since the completion of our investigations a method has been recorded by Payr[3] in which he likewise makes use of a transplanted blood-vessel. In his operation by the aid of special instruments a vessel is loosely inserted through the cortex into the ventricle, its outer end being sutured into the lateral sinus. An objection to this method would seem to lie in the fact that the inner end of the vessel which extends through a cortex under some degree of compression is floating free in a fluid also under pressure; hence it seems improbable that a vessel which would collapse under such circumstances could readily conduct away the fluid. The anastomosis with an intracranial sinus furthermore would seem to be a most difficult procedure; but should this prove to be feasible it would more nearly approximate Nature's method of draining away the fluid than any method as yet proposed.

The experiments which I have to record were begun a year ago on the suggestion of Dr. Alexis Carrel and, with the encouragement of Dr. Cushing, have been conducted in the Hunterian Laboratory. Our aim has been to establish if possible a permanent drainage between the intracranial subdural space and the cervical venous system, through the interposition of a transplanted blood-vessel.

With the knowledge that in many cases of hydrocephalus fluid from the ventricles finds its way into the subaraehnoid (and possibly subdural) space, it would seem that drainage from this space, in these cases at least, would meet the mechanical requirements of the problem. Furthermore, even when the ventricles seemingly do not freely communicate with the subarachnoid spaces it is possible at times, by a proper operation, to transform the internal into an external hydroeephalus. This will be mentioned in the clinical history to be given.

Laboratory Observations.—Six experiments were made upon normal dogs. The vessel selected for transplantation was usually a segment of the external jugular vein taken from the side of the neek contralateral to that of the proposed anastomosis; the femoral was used on two occasions. In the earlier operations, after exposing the skull in the suboccipital region, the bone was trephined and a small circular perforation was made in the center of the exposed dura. One end of the vein was then sutured to the margin of this opening, after which the vessel was carefully drawn through a track made by blunt dissection under the cervical muscles, its lower end being brought out in such a way as to permit of an easy end-to-end anastomosis by the Carrel method with the central end of the newly divided external jugular vein on the same side of the neck.

In seleeting a vein for transplantation it is desirable that one be chosen which possesses valves, the vessel being so placed that the valves prevent the upward flow of blood toward the subdural space. In the more recent operations, furthermore, the vein chosen for transplantation was reseeted so as to include at one end either a point of bifurcation (Fig. 1) or a point where an anastomosing vein of goodly size branched into it. The blade of a fine pair of scissors is then passed



Fig. 1.



Fig. 2.



Fig. 3.

through the two arms of the "Y" and their lumen is opened on the side opposite to the opening into the main vessel. Thus a fairly large rectangular flange which can be trimmed as desired is secured at one end of the main trunk, whose lumen opens in its center (Fig. 2). The segment of vein thus prepared is freely irrigated with salt solution and wrapped in gauze saturated with vaseline while the dura and jugular are being prepared for its reception. The procedure as carried out in our later operations is as follows:

A circular area of the skull is resected just above and posterior to the ear. Within this opening a flap of the exposed dura is turned down and a circular hole about the size

[3] Payr: Drainage der Hirnventrikel mittels frei transplantirten Blutgefässen. Zentralbl. f. Chir., Aug. 29, 1908, No. 35, p. 54.

of the vessel to be transplanted is made in its center. The external jugular vein is then bared by continuing the primary incision over the lower part of the skull and down across the neck, care being taken that it does not directly overlie the the vessel, thus obviating possible complications from scar formation. The exposed jugular is then ligated distally and a small bulldog clamp, protected by rubber tubing, is placed on its central end, after which the vessel is cut across, the ends thoroughly irrigated with warm salt solution, the adventitia trimmed away and the whole smeared with vaseline, as advocated by Carrel.

The vessel to be transplanted is next taken from its protecting gauze and drawn through the hole in the dura from the inside, so that the flanged end of the vessel comes to lie flatly against the inner surface of the membrane (Fig. 3). Several retention sutures are placed at the margin of the flange, anchoring it to the dura, after which a continuous through-and-through suture is carried completely around the periphery. Small blood-vessel needles with a third strand of Chinese silk well saturated with vaseline are used for this purpose. The reflected flap of dura is then replaced and the incision in the membrane is closed with the same materials (Fig. 3). The efficiency of the suturing can be tested by irrigating the subdural space with warm normal salt solution and that of the valves in the vein by irrigating upward through the vessel.

A straight intermuscular channel for the vessel is now carefully made by blunt dissection through the muscles to the exposed end of the jugular vein. The transplanted vessel is drawn through this tunnel and sutured to the central end of the divided jugular by the end-to-end method of Carrel. In no case has there occurred any regurgitation of blood through the vessel beyond its valves on removal of the bulldog clamp. In none of our experiments were there observed any ill effects from the operation. The animals promptly recovered.

After intervals varying from three weeks to three months subsequent to the transplantation the animals were chloroformed and autopsies made. In the first experiment where the vein lay directly under the line of the operative incision, the vessel was much involved in the scar tissue and its lumen was completely obliterated. Adhesions had formed also between the cortex and the dural flap. In the other five cases, where the vessel had been placed away from the line of incision, it was lying rather freely movable, with only slight adhesions. In two instances the lumen was partially obliterated, while in the other three it was patent. Although the vessels seemed smaller than when originally introduced they were elastic and pliable. No histological studies of the tissues have been made.

The results which were obtained in the later observations, in consideration of the fact that the transplanted vessel was practically functionless, were possibly what were to be expected, and it seemed probable that if a copious discharge of fluid from a hydrocephalic head were continuously taking place through the vessel it would in all probability remain patent. As the operation, furthermore, appeared to be free from any particular surgical risk and as it was thought to hold out some promise of benefit, it was believed to be justifiable to employ it in the effort to relieve a case of hydrocephalus which was under Dr. Cushing's care at the Johns Hopkins Hospital and which promised to be a case suitable for this particular measure.

The patient, a ten-months'-old baby, had shown, from the time of its premature birth, evidences of hydrocephalus, and during the three months previous to the final operation had undergone numerous attempts to relieve the pressure symptoms of the rapidly enlarging head. At various hands numerous punctures, ventricular and lumbar, had been made, with only temporary relief. After coming under our observation it was concluded from the results of combined ventricular and lumbar punctures that there was an obstruction in the neighborhood of the fourth ventricle—in other words, that the ventricular fluid communicated but little, if at all, with the arachnoid spaces. In an endeavor to allow vent for the fluid six months before the final operation the bulging lateral wall of the third ventricle had been opened by an operation conducted under the right temporal lobe. For several weeks this measure had promised to give permanent relief, for during this period there was a complete collapse of the fontanelle associated with a rapid improvement in nutrition and a disappearance of the muscular rigidities and other nervous symptoms. This period of temporary improvement was suddenly interrupted by a rapid refilling of the ventricles which in the course of 24 hours led to a tense bulging of the fontanelle which even exceeded the previous condition. The tension became so great that on numerous occasions ventricular punctures were urgently necessitated in order to ward off what seemed to be threatened medullary paralyses from pressure—symptoms accompanied by a slow pulse, convulsions, Cheyne-Stokes' respiration, etc.

One remarkable feature of the case at this time lay in the fact that there was a great difference on the two sides of the head in respect to light transmission. On looking through the head in a saggital direction toward a bright light, the right side of the head—namely, that upon which the operation had been performed—was much more translucent than the left, evidencing, as was supposed, an extracerebral accumulation of fluid on this side—in other words, a unilateral external hydrocephalus; whereas, on the other side the lateral ventricle apparently remained full with a complete distension of the hemisphere as before.

This condition of supposed unilateral external hydrocephalus with fluid in all probability in the subdural space made it seem an unusually favorable opportunity to try and establish an escape for the fluid by the method which had been undertaken in the experiments described above.

The operation was performed July 23, 1908. It proved much more simple in accomplishment than had been the case with the canine experiments. Under cocaine anæsthesia a portion of the cephalic vein was taken from the father's arm,

including the bifurcation of the vessel at the elbow. This vessel was placed in protective vaseline as described in the laboratory experiments. Examination of the child had shown that in the lower portion of the external jugular on the right side there were two valves which prevented any expiratory regurgitation of blood into the external jugular, for the vein proximal to this point dilated markedly when the child cried, and in this part of the vessel could be seen an expiratory pulsation which did not pass above the valves. The condition seemed most favorable therefore for the transplantation, and the presence of these valves in the external jugular did not demand the transplantation of a vessel which also should possess them.

A longitudinal incision was made over the right suboccipital region and carried down in the neck toward the clavicle in the neighborhood of the visible external jugular vein. The soft parts over the suboccipital region were scraped away and an opening about 2.5 cm. in diameter was made in the bone, exposing the dura over the right cerebellar lobe. A flap of dura was turned down with its base toward the neck, and the center of the flap punctured as described above. Through this small opening in the membrane the vein from the father's arm was drawn and the circular flange was sutured in place. The end of the vessel was then passed underneath the splenius and brought out in the lower part of the posterior triangle of the neck, so as to allow a convenient end-to-end anastomosis by the Carrel method with the end of the external jugular just above the situation of the described valves. The wound was then closed without drainage.

The child stood the operation well, and the fontanelle remained soft, but a few hours later a sudden elevation of temperature occurred such as is not uncommonly seen after operations, upon the central nervous system, particularly of infants, supposed in the absence of leucocytosis and with no wound infection to be due to some central thermic disturbance. This unlooked-for complication, which was followed by death shortly after, was the more unexpected since the child had stood the previous rapid withdrawals of fluid by puncture and the earlier much more serious and extensive operation without any complication whatsoever.

The report of these experiments and of this single operative experience with a clinical case is presented merely as a suggestion of what may possibly be accomplished by applying the methods of blood-vessel anastomosis, which have been perfected by Alexis Carrel, to the establishment of drainage in suitable cases of idiopathic hydrocephalus.

AN EFFORT TO DETERMINE THE SENSORY PATH FROM THE OCULAR MUSCLES.

By P. W. Harrison, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

Following the intracranial resection of the *Nervus trigeminus* for neuralgia or—what physiologically amounts to the same thing—the extirpation of the Gasserian ganglion, it has been observed that there is present on the anæsthetic side of the face a very evident loss of the sense of position in many of the muscles supplied by the *N. facialis*. This can be demonstrated in all cases by faradization of the muscles underlying the anæsthetic field, for when thus stimulated, movements in the corner of the mouth, in the ala nasæ or in the orbicularis palpebrarum can be elicited without the patient being aware of them. Though inconspicuous in many patients even though closely observed, in rare instances the condition may be so apparent as to simulate either the flaccidity which accompanies, or the contracture which follows, a slight facial palsy, and certain acts which require a symmetrical movement, such as whistling, are usually performed with difficulty..

This state of things would naturally be expected inasmuch as the muscular branches of the facial nerve contain no afferent fibers, so far as is known, and in the embryo all structures which arise headward from the first visceral cleft appear to receive their sensory innervation from the trigeminus. But according to this view one would suppose that the sensory fibers from the ocular muscles would also be found in the trigeminal nerves, so that by analogy with the condition which occurs in the expressional muscles, some loss of sense of position would be expected in the eye on the side of the neurectomy. This, however, does not occur, for except in the cases, now fortunately rare, in which there has been some slight pressure palsy of the *N. abducens* leading to diplopia from loss of motor function in the external rectus, no disturbance which can possibly be attributed to loss of muscle sense can be detected. This would make it seem probable, on clinical grounds, that there are afferent fibers from the ocular muscles which reach the brain by other pathways than the trigeminal nerves.

The so-called neuro-tendinous spindles which occur in the extrinsic muscles in the eye as well as in other parts of the body have been commonly assumed, since their first discovery, to be organs of muscle sense. The chief reason for regarding them as such seems to be that at present we know of no other organs to which this function may be ascribed and no other function to ascribe to these organs. These "neuro-tendinous spindles," or "neuro-musculo-tendinous end-organs," or "neuro-muscular spindles," as they have been variously called.[1]

[1] As the names indicate, these spindles usually are found in the transition zone between muscle and tendon. Ciaccio, however, in the superior rectus muscle of the human eye found certain

consist of small, transparent, cylindrical structures underlying the sheaths which surround certain tendon fasciculi, near the termination of the muscle fibers, and in each spindle a sensory nerve breaks up into its terminal arborization of non-medullated branches.

These organs were probably observed for the first time in 1875 by Sachs in Kühne's laboratory and independently in 1876 by Rollet. Rollet's studies were chiefly confined to the frog, but the organs were found by Sachs in the tendons also of the salamander, mouse and cat. An accurate description of them was made by Golgi in 1880, who demonstrated their presence not only in the lower vertebrates but in the rabbit, mouse, dog, cat and man; and to him Huber gives the chief credit of recognizing the special nerve end-organ of tendons. Marchi was the first to demonstrate their presence in the tendinous portion of the extrinsic eye muscles of a number of mammals, including man, practically the only tendons of the body in which they had not been observed by Golgi. In this latter situation they have since been made the object of particular study by Ciaccio, Sherrington and Huber.[2]

The distribution of the motor end-plates occupies the central fleshy part of the long ocular muscles, whereas the somewhat smaller medullated fibers regarded as sensory, pass to the tendinous end of the muscles. From their anatomical configuration one would imagine that these myelinate nerve fibers at the insertion end of the muscle must be afferent, for many of them, passing down for a short distance usually on the surface of the tendon as has been described by Sherrington and Huber, then turn back toward the fleshy end of the muscle fibers where their terminal end-organs lie. One finds no motor plates in this situation.

Cattaneo, in 1888, made the first experiments to determine the functions of these spindles which Sachs had believed to subserve the muscle sense. He found no degeneration of the nerves running to these spindles in the extremities after section of the posterior roots of the spinal cord, and likewise none after section of the anterior roots. Following the section of a peripheral nerve, however, degeneration did take place, and Cattaneo concluded from this and from their anatomical position that the spindles in question were sensory nerve endings and probably organs of muscle sense.

In 1897 the question was raised by Sherrington as to whether afferent fibers did not exist in the cerebral nerves controlling movements of the eye—nerves previously regarded as purely motor. This question was answered in a series of papers[3] reporting the results of degeneration experiments. He found after intracranial section of the *N. oculomotorius* in monkeys that all myelinate nerve fibers in the corresponding muscles subsequently degenerated, with the exception of a few fibres, all of small caliber, which supposedly were connected with the ciliary ganglion or sympathetic. They evidently did not come from the *Nn. trigemini*, for after the bilateral intracranial division (in one monkey) of these nerves no obvious impairment in the movements of the eyeballs occurred, nor was there any evident lowering of muscle tonus such as Cattaneo found in the body musculature after section of the posterior spinal roots. Furthermore, no degenerated myelinate fibers were subsequently found in any of the ocular muscles. This widespread degeneration of fibers, presumably sensory in character, which occurred after division of the oculomotor but not after division of the trigeminal nerves, was naturally regarded as an indication of the existence of sensory fibers in the IIIth, IVth and VIth cerebral nerves.

Sherrington further made the experiment of cocainizing the conjunctiva of man and found that no loss of coordinate movement occurs—a further evidence that trigeminal sensation has no influence in the sense of position of the eyes and that an apparatus for muscular sense is required, the only apparent channels for which would seem to be the IIId, IVth and VIth nerves.

Huber and De Witt (1900) in an elaborate study[4] of the end-organs of muscular tissues of many animals (frog, tortoise, bird, rat, cat and dog), using the *intra vitam* methylene blue method, concluded that the sensory nature of the spindles must be regarded as proven by the experiments of Cattaneo and Sherrington, but that anything further as to their special function at present remains uncertain.

Our own experiments were undertaken with the object of observing in the dog degenerations such as Sherrington had found in monkeys after intracranial division of the IIId and Vth nerves. The individual experiments were undertaken as follows:

Under anæsthesia and with the usual aseptic precautions, after reflecting the temporal muscle the cranium was opened on the left side and the desired nerves were divided at the base of the brain—intradurally in the case of the oculomotor and extradurally, as in the usual trigeminal operation in man, in the case of the trigeminus itself. After a period varying from seven to ten days—a length of time which we thought sufficient to allow of complete degeneration of the end-organs—the animals were anæsthetized and either the heart or one of the large vessels was opened and allowed to bleed until the body was exsanguinated. The carotids were then exposed, and a one per cent solution of methylene blue in normal salt solution (according to Ehrlich) was injected, until the scleræ and mucous membranes acquired a distinct blue color. In from thirty minutes to an hour later the bony wall of the orbit was removed and the exposed ocular muscles were resected by

end-organs which were tendinous at both extremities. The Golgi end-organs under discussion are to be distinguished from the Pacini corpuscles, Krause's end-bulbs, etc., of tendons.

[2] G. Carl Huber: Sensory Nerve Terminations in the Tendons of the Extrinsic Eye Muscles of the Cat. Journ. of Compar. Neurol., 1900, Vol. X, p. 152.

[3] C. S. Sherrington: Further Note on the Sensory Nerves of Muscles. Proceedings of the Royal Society of London, 1897, Vol. LXI, p. 247. Further Note on the Sensory Nerves of the Eye Muscles, Ibid., 1898-1899, Vol. LXIV.

[4] G. C. Huber and S. M. De Witt: A Contribution to the Nerve Terminations in Neuro-tendinous End-organs. Journ. of Compar. Neurol., 1900, Vol. X, p. 159.

cutting them as near to their attachments as possible. The appearance of the blue stain in the nerve fibers and endings was then observed under the microscope in the teased-out musculo-tendinous fibers, after which the stained tissues were fixed in ammonium molybdate (Bethe).[5] Treated by this method no degenerated nerve fiber will take up the stain, and any muscle therefore which shows well-stained neuro-tendinous spindles and nerves leading to them could not have had its sensory fibers cut at the previous operation ten days before.

One anatomical difficulty was encountered at the outset. To secure a successful stain it is necessary to remove the muscles from the orbit as quickly as possible, and this, coupled with the fact that the dog has a second row of muscles (retractor oculi muscles) lying within and in close proximity to the four recti, made it difficult oftentimes to accurately identify the individual muscles as they were removed. Fortunately, however, the identification of the inferior oblique was always easy, and a number of our observations depend consequently upon the conditions found in this muscle. It was our expectation, with uniform results in our staining methods, that we could eliminate one muscle after another so that finally it would be possible to determine the sensory pathway from each of them. This plan was frustrated by the fact that even after division of the oculomotor nerve the expected evidences of degeneration were not apparent in the sensory end-organs.

The experiments may be divided into two series. In the first the *N. oculomotorius* was divided by an intradural operation at the base of the brain—a comparatively simple operation in the dog, provided the dura is not opened until the point of attachment of the membrane as it encloses the trigeminal nerve is reached. Then, on elevating the temporal lobe slightly and making a small incision in the dura, through which a smooth elevator can be passed, the glistening IIId nerve comes plainly into view and can be divided with great ease. In all instances the wounds healed without reaction and after a week or ten days the animals were sacrificed and the eye muscles examined in the manner described above. Needless to say, clinical evidence of the division was shown in all cases by the dilatation of the pupil, and a careful postmortem examination was made to assure ourselves of the completeness of the lesions and the absence of local complications. Four observations in this series gave results deserving consideration.

(Number 1.) IIId nerve divided. One rectus muscle showed definite staining of the neuro-tendinous spindles as well as of the sensory nerves leading to them.

(Number 2.) IIId nerve divided. Two superior recti muscles showed good staining of nerves and spindles.

(Number 3.) IIId nerve divided. No nerves or spindles were found to have been stained.

(Number 4.) IIId nerve divided. Three of the muscles, the inferior oblique being one of them, showed a satisfactory stain of nerve and spindles.

The second series of experiments concerned the *N. trigeminus*. The surgical removal of this nerve in the dog presents great difficulties, in consequence of the partial bony encasement of the ganglion. In our earlier experiments we satisfied ourselves with the simple division of the sensory root—an operation which necessitates the careful chipping away of a portion of the tip of the petrous bone. This procedure, unless carried out with great delicacy, will lead to injury of the petrosal sinus and to a degree of bleeding which is incompatible with a successful and certain neurectomy. In order to assure ourselves that the absence of degeneration was not due to our failure to remove the ganglion cells, other operations were performed in which the entire ganglion was removed, in some ways a still more difficult procedure in the dog than simple root division. Six of these experiments were in all respects successful, and the results of these alone need be given.

(Number 5.) Trigeminal root divided. Neuro-tendinous spindles and nerves leading to them successfully stained in the four muscles examined.

(Number 6.) Trigeminal root divided. Nerves and spindles perfectly stained in the inferior oblique muscle.

(Number 7.) Gasserian ganglion extirpation. Nerves and spindles well stained in the five muscles examined.

(Number 8.) Extirpation of ganglion. Fair stain of nerves and spindles in the inferior oblique muscle.

It can be seen from these observations that with the exception of Number 3, in which no nerves or spindles were stained—a result which was attributed to a faulty technique—a satisfactory staining of these supposedly sensory endings was present in certain of the muscles supplied by the oculomotor nerve at a sufficient time after its division to allow, as we supposed, for complete degeneration in case this were to occur after the neurectomy.

Though the possibility that the IVth and VIth nerves might constitute the sensory pathway in question seemed remote, it was our intention to undertake a third series of experiments in which the IIId, IVth, Vth and VIth nerves should all be cut, but we were unable to overcome the surgical difficulties of this procedure in the time at our disposal. The only animal upon which the operation was successfully carried out succumbed to an infection after a lapse of three days—a period not sufficient for the purposes of the experiment.

A further series of observations should be made, with division of the post-axial fibers of the sympathetic, to eliminate this nerve from the problem, though it is improbable that section of the sympathetic would lead to any evidences of degeneration in these organs under discussion.

The results of our experiments thus briefly recorded do not coincide with those obtained by Sherrington, and furthermore are opposed to our own preconceived views of the matter acquired from the clinical observations mentioned in the intro-

[5] This, briefly, is the technique which Prof. G. Carl Huber has himself carefully described, and one of us (Harrison) was privileged to learn it at first hand in his laboratory. We are further indebted to Prof. Huber for his kindness in looking over some of the specimens obtained from our own experiments.

ductory paragraphs. Whether our failure to find evidence of degeneration in these organs after dividing the oculomotor nerve is due to the fact that the pathway from the neuro-muscular spindles lies elsewhere than in these nerves; or, that through some technical fault we were unable to get the expected evidence of degeneration; or, that these, after all, are not organs of muscle sense but serve some entirely different function, must be left undetermined for the present.

Our failure to confirm the results of previous investigators along these lines we trust will stimulate others, as it will ourselves, to further investigations, for it is a matter of considerable physiological interest and importance to know whether the oculomotor nerves are actually mixed nerves or contain, as was long supposed, purely efferent fibers. The absence of any loss of muscle balance following division of the trigeminus, as well as the failure to find any degenerations in what are supposed to be the musculo-sensory organs of the ocular muscles, confirms Sherrington's observation that the trigeminal nerves at least do not convey the sensory impulses from the muscles in question.

A NOTE ON SOME METHODS OF ANASTOMOSING BLOOD-VESSELS.

By B. M. Bernheim, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

Cuff Method of Anastomosis.

The careful removal of the adventitia from the divided ends of the blood-vessels is one of the most important steps in making a successful anastomosis. This is easily accomplished in the case of the artery, but, owing to the great contractility of the vein, considerable time and undesirable handling is often required, resulting not infrequently in injury to the intima with subsequent thrombus formation.

To avoid this the following method is suggested of everting a cuff of the vein (or artery if desired), whereby the removal

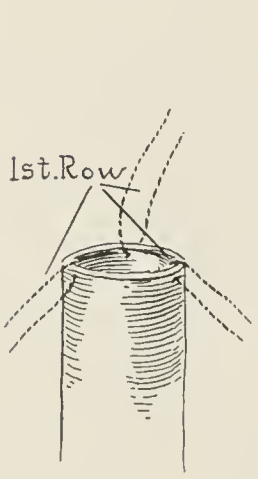


Fig. 1.

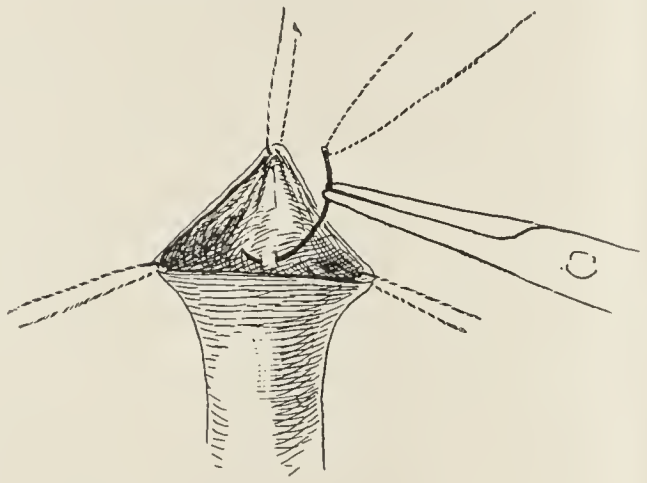


Fig. 2.

of the adventitia is rendered unnecessary and in the suture intima is of necessity apposed to intima.

After dividing the vein or on removing a section of it, without further handling, three stay sutures are applied at equidistant points around the lumen just on the cut edge, according to the method of Carrel (Fig. 1). By equal traction upon these sutures the mouth of the vessel will be thrown open into a wide triangle (Fig. 2). With a small curved French needle, threaded with the finest silk, three additional stay sutures are placed in the same lines as the former ones, but about one-fourth of an inch or more down *in* the lumen of the vessel (Fig. 3). Traction on the second row in one direction and on the first row in the opposite direction will evert the cuff (Fig. 4). The anastomoses can then be accomplished by Carrel's method, the needles and threads of the second three stay sutures being used for catching up and triangulating the end of the artery at three corresponding points[1] (Fig. 5).

At the completion of the suture the cuff (1) can be thrown forward and sutured to the adventitia of the artery (Fig. 6); or (2) can be turned back and sutured to the adventitia of

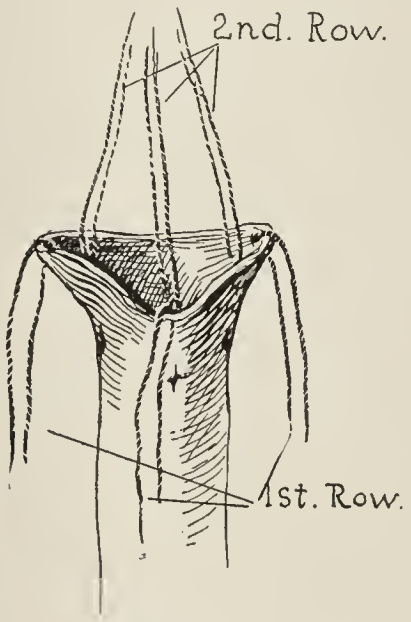


Fig. 3.

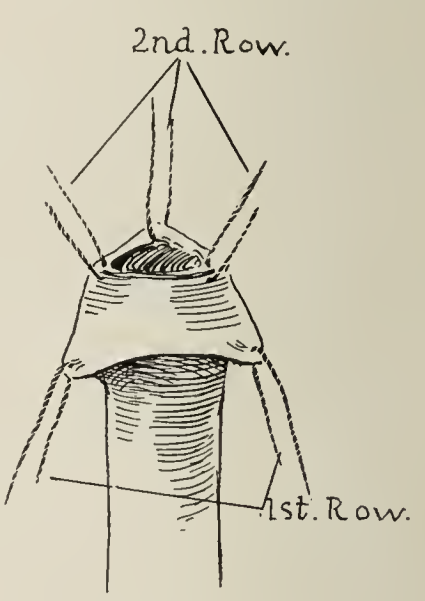


Fig. 4.

the vein; or (3) in case a segment of vein is to be interposed in an arterial defect, the two cuffs can be made of such size that, when thrown back from each end of the vessel, they will meet and can be sutured together, thus making a vein of double thickness.

Doubling the Vein.

To restore a defect in an artery, such as occurs after the extirpation of an aneurism, either a segment of another artery or of a vein must be used. As there are no superfluous

[1] Conditions might arise where it would be desirable to have a very large cuff. This could easily be made by everting the vessel over the end of a canula, similar to but with a longer cylinder than that devised by Crile for transfusions.

arteries in the body and their preservation for purposes of transplantation has not as yet been rendered practicable, it is neeessary to use a vein.

Owing, however, to their relative struetural weakness, veins

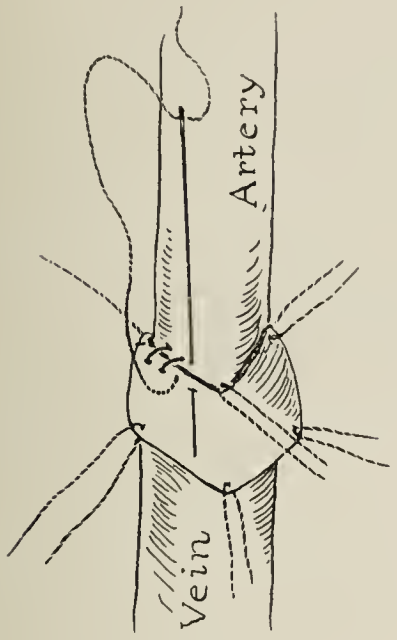


Fig. 5.

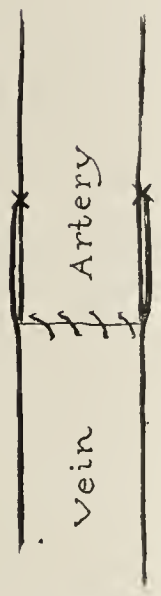


Fig. 6.

are not well adapted to endure arterial pressure, and eonsequently after a transplantation a considerable, often an astonishing, dilatation oeeurs; this is followed by an hypertrophy of the venous walls, whieh may in eourse of time in-

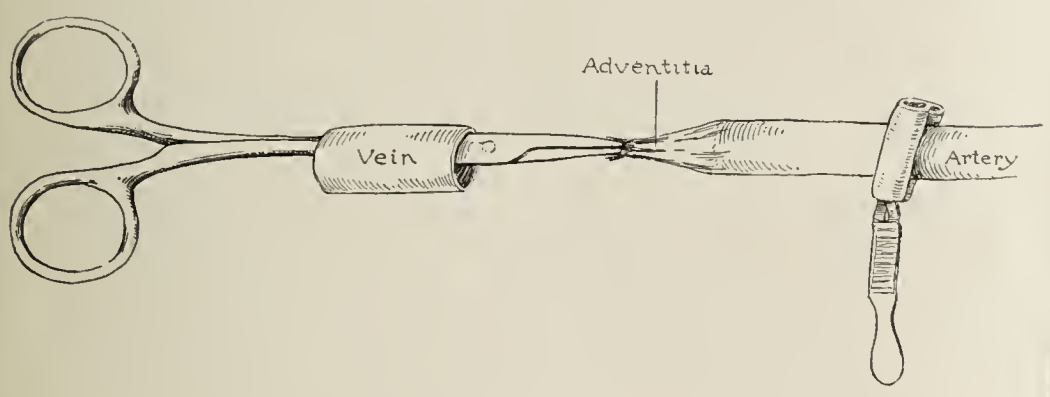


Fig. 7.

crease to sueh an extent as to obliterate the lumen, for an early selerosis is not an infrequent oeeurrenee.

In order to lessen this strain and also to render more seeure the lines of suture, the following method of doubling or even tripling the thiekness of the transplanted veins is suggested.

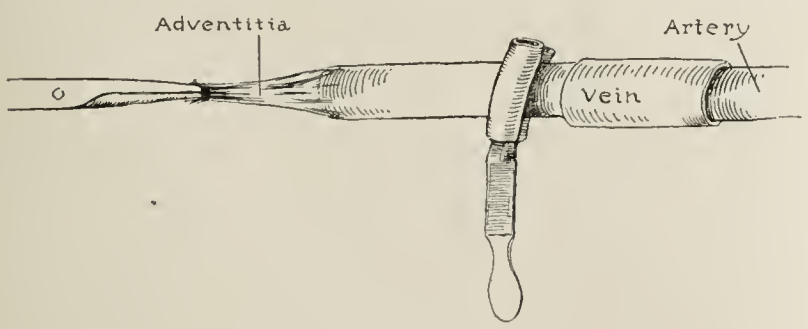


Fig. 8.

Two segments of vein are taken—one almost twiee as long as the other. The longer pieee is threaded on a "mosquito" elamp, whieh then grasps the adventitia of one end of the artery (Fig. 7), thus allowing the vein to be threaded over the artery to a point beyond the bulldog elamp obstrueting the blood-flow (Fig. 8). The shorter pieee of vein is then anastomosed between the two ends of the artery. After removing the bulldog clamps and controlling all leakage from the two lines of suture the longer pieee of vein is slipped over the anastomosed segment, in whieh position its ends are attaehed to the adventitia of the artery by three interrupted sutures (Fig. 9).

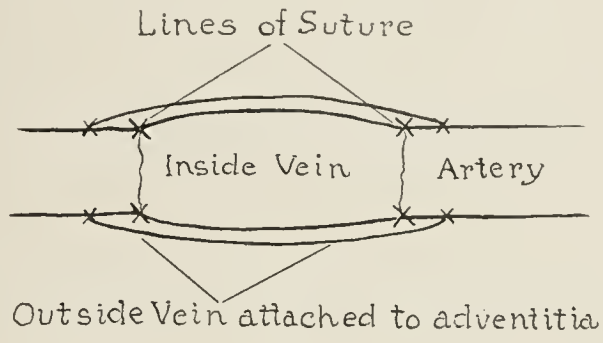
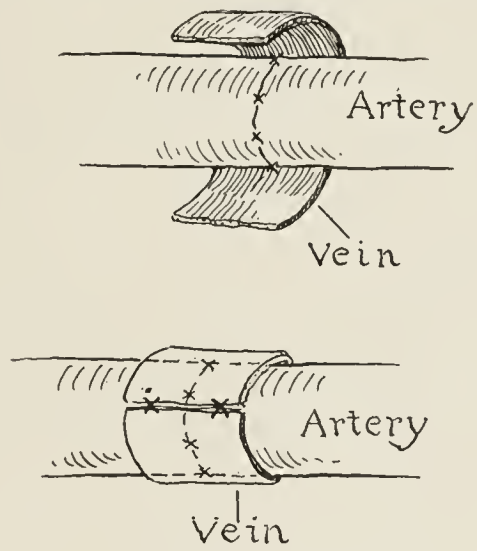


Fig. 9.

Securing the Line of Suture.

Just as in intestinal work, so in blood-vessel sutures eonditions arise where it might be advisable to proteet and strengthen the line of suture. This ean be done either by "threading" a pieee of vein over the line of suture, as deseribed above, or by first performing the anastomosis and



Figs. 10 and 11.

then folding around the suture a segment of vein previously slit open (Figs. 10 and 11).

A number of anastomoses have been performed by these methods, full reports of whieh, with the mieroseopieal findings, it is purposed to give in a later paper.

THE JOHNS HOPKINS HOSPITAL BULLETIN.

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ON THE EFFECT OF NARCOSIS UPON THE BODY TEMPERATURE.

By S. Griffith Davis, M. D.

(From the Hunterian Laboratory of Experimental Medicine.)

In his important monograph published in 1880, Otto Kappeler[1] laid stress upon the loss of body temperature of human patients during anæsthesia. In twenty surgical etherizations he found an average fall of 0.68° C., a maximum loss of 1.5° C. and a minimum loss of 0.3° C. Excluding the cases with preexisting fever, there was an average loss of 0.52° C. The fall of temperature becomes first apparent in from ten to twenty minutes after beginning inhalation. The shortest time in which the greatest fall was observed was twenty minutes; the longest time was two hours. The average greatest fall occurred in 60.4 minutes. Occasionally a slight temporary rise was observed coincident with the struggling of the primary stage of anæsthesia.

Kappeler also made observations on thirty human patients under chloroform and found with this drug an average loss of temperature of 0.59° C., the extremes varying between 1.1° C. and 0.2° C. Usually at the cessation of anæsthesia the temperature was found to return slowly to the normal, though in a few instances it continued to fall. In non-febrile cases the average loss was 0.53° C., corresponding practically with that observed under ether. The first drop never appeared earlier than ten minutes after beginning the inhalation, the average time being from fifteen to twenty minutes. The lowest fall occurred at a time averaging fifty minutes when the most profound appearances of narcosis were for the most part over, though it may be said that the more profound the narcosis the greater was the fall in temperature. According to Kappeler's observations it was rare for the temperature to return to the normal in less than an hour; occasionally it required five hours. During the period of active excitation in a few instances a slight primary elevation of circulation and temperature was noted.

Similar observations were published in 1888 by H. A. Hare,[2] who found in thirteen cases an average loss of 2.5° F., the greatest loss observed being 4.4° F. and the least 1.2° F. The temperature in these cases was taken by axilla. In thirteen instances in which the duration of anæsthesia as well as the character of the operation was noted, he observed an average fall of 2.32° F. The maximum loss occurred in a case of carcinoma of the breast, namely, 3.15° F.; the minimum loss, namely 0.8° F., occurred during a thoracotomy for empyema. Hare also found that the rectal temperature of a dog, during the course of an hour's etherization might fall from 8° to 10° F. below the normal.

Dastre's comprehensive work on anæsthesia (1890)[3] speaks briefly of Kappeler's observations and regards the diminution of oxidation as the principal cause of the lowered temperature rather than immobility or radiation of heat from the uncovered portion of the body., The studies of Paul Bert and of Rumpf favor this view. In addition to this action of the drug on the tissues, Dastre considers that the thermoregulatory centers are probably affected as well.

One of the most comprehensive reports on this subject, based upon the results both of experimental and clinical observations, was made by Dudley P. Allen[4] in 1897. Thirty-five experiments were made upon dogs showing that they lose heat in a marked degree under prolonged anæsthesia with the body exposed to ordinary room temperature, e. g. 65° to 75° F.; also that this loss may be partially if not entirely obviated by preventing the radiation of heat with abundant coverings. He found further that the temperature may actually be increased if in addition to these coverings the animal be surrounded with hot water bottles. It seemed obvious from these observations that the alterations in temperature were attributable to the anæsthesia, and it was noted that the temperature after cessation of the anæsthetic tended to return to the normal, whether it had been forced above its proper level by external heat or had fallen below in consequence of exposure. This return was more rapid in the case of ether than of chloroform. He found, too, that in a room having an unusually high temperature, namely, from 93° to 96° F., the body temperature of the animal was rapidly raised under anæsthesia, in some cases even to 4.6° F., irrespective of the degree of exposure of the body. In the human patient he found that a loss of from 0.2° F. to 2° F. commonly occurred, 0.6° F. representing the average loss in the eighty recorded cases.

In 1903 W. H. Morley,[5] in an article devoted to this same matter, also describes the lowering of body temperature under ether anæsthesia. He favors the view that the lowered temperature is due to increased output of heat in consequence of dilatation of the cutaneous vessels and to lessened heat production from diminished muscular movement. He urged that stringent precautions be taken against the loss of body heat during anæsthesia by having the patient well protected and in a warm operating room, believing that many of the so-called postoperative pneumonias are a consequence of the patient being chilled while in a state of narcosis.

In his well-known volume, W. F. Hewett[6] comments upon the surgical importance of maintaining the body heat, in view of the loss of temperature which invariably occurs during the

[1] Kappeler: Anæsthetica. Deutsche Chirurgie, 1880, pp. 33 and 168.

[2] Hare: Experiments to Determine the Influence of Etherization on the Normal Bodily Temperature, etc. Therapeutic Gazette, 1888, Vol. XII, p. 317.

[3] A. Dastre. Les anesthésiques: physiologie et applications chirurgicales. Paris, 1890.

[4] Allen: Effect of Anæsthesia upon the Temperature and Blood-pressure. Tr. Am. Surg. Ass., 1896, Vol. XIV, pp. 367-389.

[5] Morley: The Effect of Anæsthesia upon the Body Temperature. American Gynecology, 1903, No. 3, pp. 300-304.

[6] Hewett: Anæsthetics and Their Administration, 3d Edition, 1907, p. 234.

administration of ether and chloroform. He mentions further that "covering cutaneous areas with towels wrung out of antiseptic solutions is open to considerable objection."

These and similar reports have thus evidenced the possible relation between postoperative pulmonary complications and the lowering of temperature due to the combination of anæsthesia and exposure. A number of particularly cautious operators consequently have made it a rule to protect the body against such a possible thermic loss by insisting upon the employment of some form of heated operating table, such as that of Kronig, but it must be acknowledged that the importance of these matters has been overlooked or ignored by the greater number of surgeons.

From the Hunterian Laboratory a year ago, C. W. Mills[7] made a report upon the alterations of body temperature occurring in anæsthetized animals, and it is the purpose of this paper to record further observations made along similar lines, and to suggest applications which may be of some practical importance. For greater accuracy in the work special charts were designed for the recording of temperature alongside of the blood pressure, pulse and respiration, so that the plotted curves become comparable in a measure to the kymographic tracings of the physiological laboratory. The keeping of such a record adds considerably to the anæsthetist's duties, but by a method of continuous auscultation, the cardiac and the respiratory sounds can be transmitted directly to the ear and thus easily recorded, without the necessity of feeling for the pulse.[8] The temperature records were taken per rectum and accurate centigrade clinical thermometers were used, which

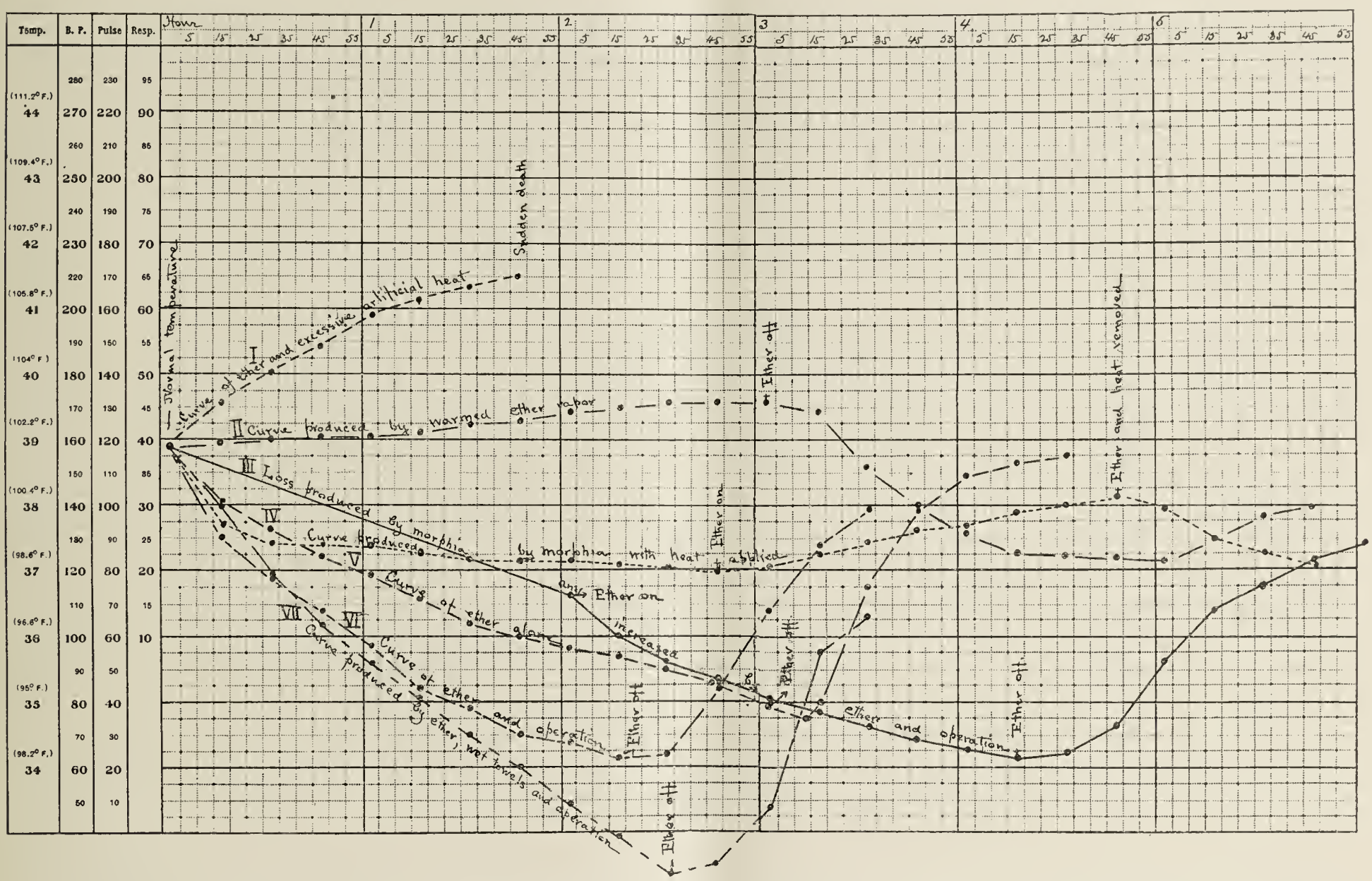


Chart 1.—A composite of the curves of all the observations under seven different conditions. (1) Curve produced by ether and artificial heat, raising the temperature to such a degree that death resulted. (2) Showing practically normal level under warm ether vapor alone, and support of body temperature by this means with fall in temperature after cessation of anæsthesia. (3) The average curve produced by preliminary morphia increased by operation under ether. (4) Curve produced by morphia with application of external heat. (5) Curve produced by ether alone without operation. (6) Curve as influenced by ether and operation together. (7) Curve produced by ether and operation, showing increase in thermic loss when the patient's body is wet.

[7] Mills: On the Alterations in Body Temperature Produced in Dogs by Morphia and Ether. Johns Hopkins Hosp. Bull., 1907, Vol. XVIII, p. 469.

[8] This simple device and some of its advantages, both to the operator and the anæsthetist, have been described by Dr. Cushing (J. Am. Med. Ass., 1909, LII, p. 187).

The apparatus consists of the transmitter of a Bowles stethoscope connected by a rubber tube 36 inches long with a hard rubber ear-receiver of a phenendoscope. A metal headband, such as is used by a telephone operator, holds the ear-piece against the external auditory meatus. The bell of the stethescope is strapped on the patient's chest with adhesive plaster over the point of maximum impulse.

With this method of continuous auscultation, not only can a

not only allowed a lower registration than the simple clinical instruments which had been employed by Dr. Mills, but also a continuous reading.

For the sake of uniformity, the laboratory observations were made almost exclusively upon short-haired dogs of the fox-terrier type.

Experimental Observations.

(I) *The effect of confinement alone in the usual dorsal position on the table.*

No. 1. Weight 5 kg. After confinement on the table for two hours, a fall of 0.5° C. occurred in the latter part of the observation.

No. 2. Weight 6 kg. No variation in temperature occurred in this animal, although he remained on the table for two hours.

(II) *The effect of morphia alone with the animal in the same position.*

No. 3. Weight 9 kg. Morphia 16 mg. Temperature of room 19.3° C. Temperature of animal before morphia was given 38.6° C. One-quarter of an hour after morphia it had fallen to 38° C.; in half an hour to 37.6° C.; in three-quarters of an hour 37.4° C.;

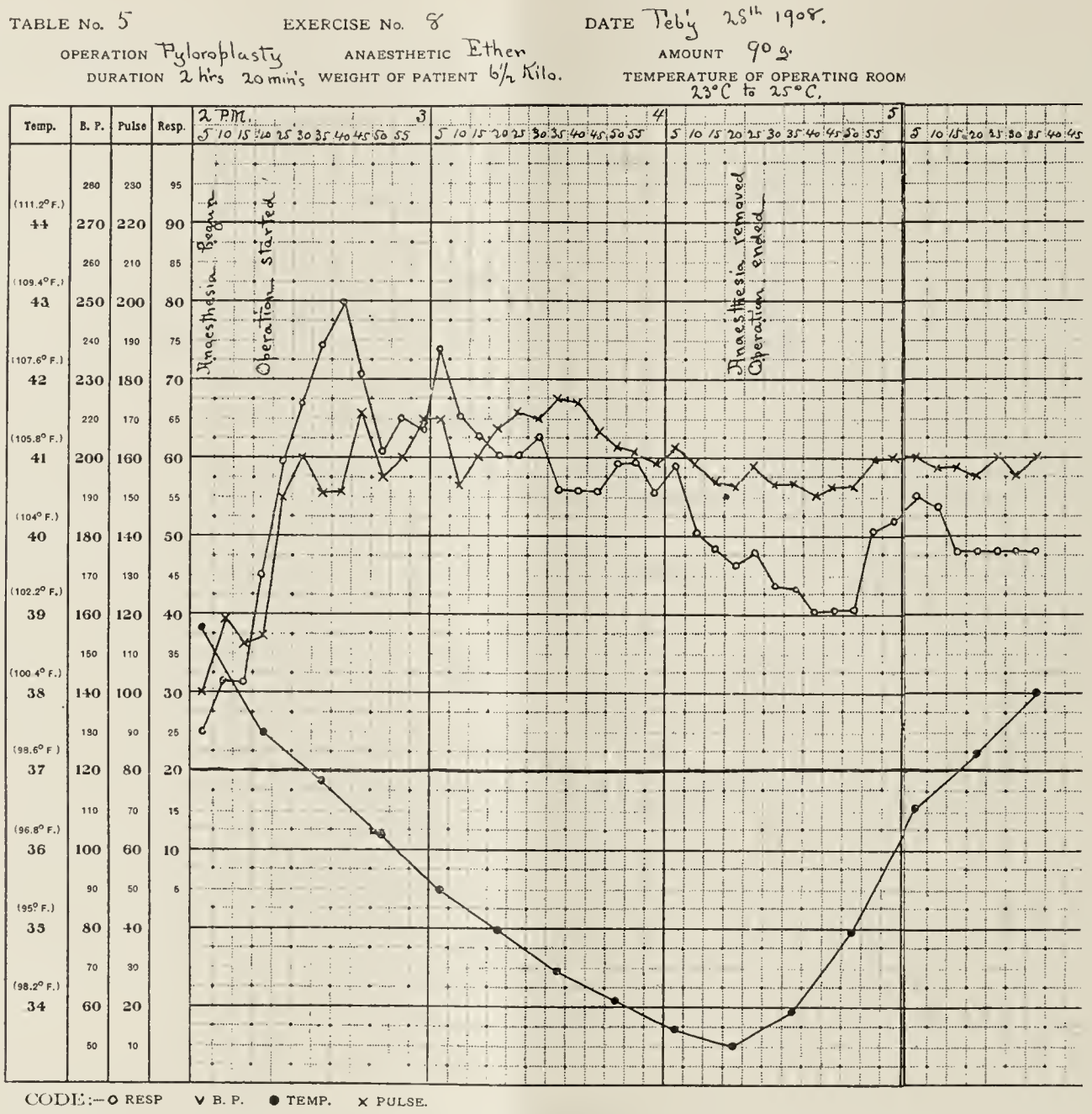


Chart 2.—Individual chart showing alterations of pulse rate, respiration and temperature during the course of an operation for pyloroplasty in a dog under ether anæsthesia without preliminary administration of morphia; ordinary operating room conditions without special precautions to preserve body temperature by external application of heat. Note rapid fall of temperature of over 9° F. from the first administration of the anæsthetic until its removal, with prompt return to the normal after cessation of administration.

Two docile animals were placed in the usual dorsal position, where they were confined and remained exposed without covering. Though kept reasonably quiet by cajoling and patting, some restlessness was inevitable and may have served to keep up the body temperature.

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record of pulse and respiratory rate be easily kept during the operation, but the anæsthetist is able to continuously estimate their activity without the necessity of disengaging a hand for the palpation of a peripheral vessel or of looking away from his immediate task to observe respiratory movements.

in one hour to 37.3° C.; in two hours to 37.2° C.; making a total loss of 1.4° C. (2.52° F.) in two hours, most of which had occurred during the first hour.

No. 4. Weight 12 kg. Morpnia 16 mg. Temperature of room 22.2° C. Temperature of animal before morphia was given 39° C. During the first fifteen minutes the animal was very restless, and the temperature remained stationary; during the next fifteen minutes there was a fall to 38.5° C.; in half an hour it had fallen to 38° C.; in three-quarters of an hour to 37.6° C.; in one hour to 37.5° C.; in one hour and a quarter to 37.4° C., where it remained for two and a half hours. At this time the confining

straps were loosened and more liberty was given. The temperature immediately began to rise, reaching 38.2° C. at the end of two hours. The animal was then freed and allowed to run about. The temperature immediately made a rapid rise, reaching 39° C. in three-quarters of an hour. During the first hour the fall had been very rapid, amounting to 1.4° C.; in the second hour it only amounted to 0.1° C., making the total fall of 1.5° C. (2.7° F.) in two hours. The pulse and respiration of these animals fell rapidly during the first hour and then remained about stationary.

(III) *The effect of ether alone with the animal in the same position* (cf. Curve IV, Chart 1).

of 0.7° C. occurred. The temperature of the room at the conclusion of the observation was 20° C.

(IV) *The effect upon temperature by an operation under ether alone* (cf. Curve VI, Chart 1 and Chart 2).

Observations were made upon seven animals employed in the operative surgery course. Their weight varied from 5 to 7.4 kg. The temperature of the room varied from 20° to 25° C. The average body temperature before anæsthesia was 38.8° C., and the average fall after two and one-quarter hours reached 34.1° C., making a total loss of temperature of 4.66° C. (8.39° F.). The

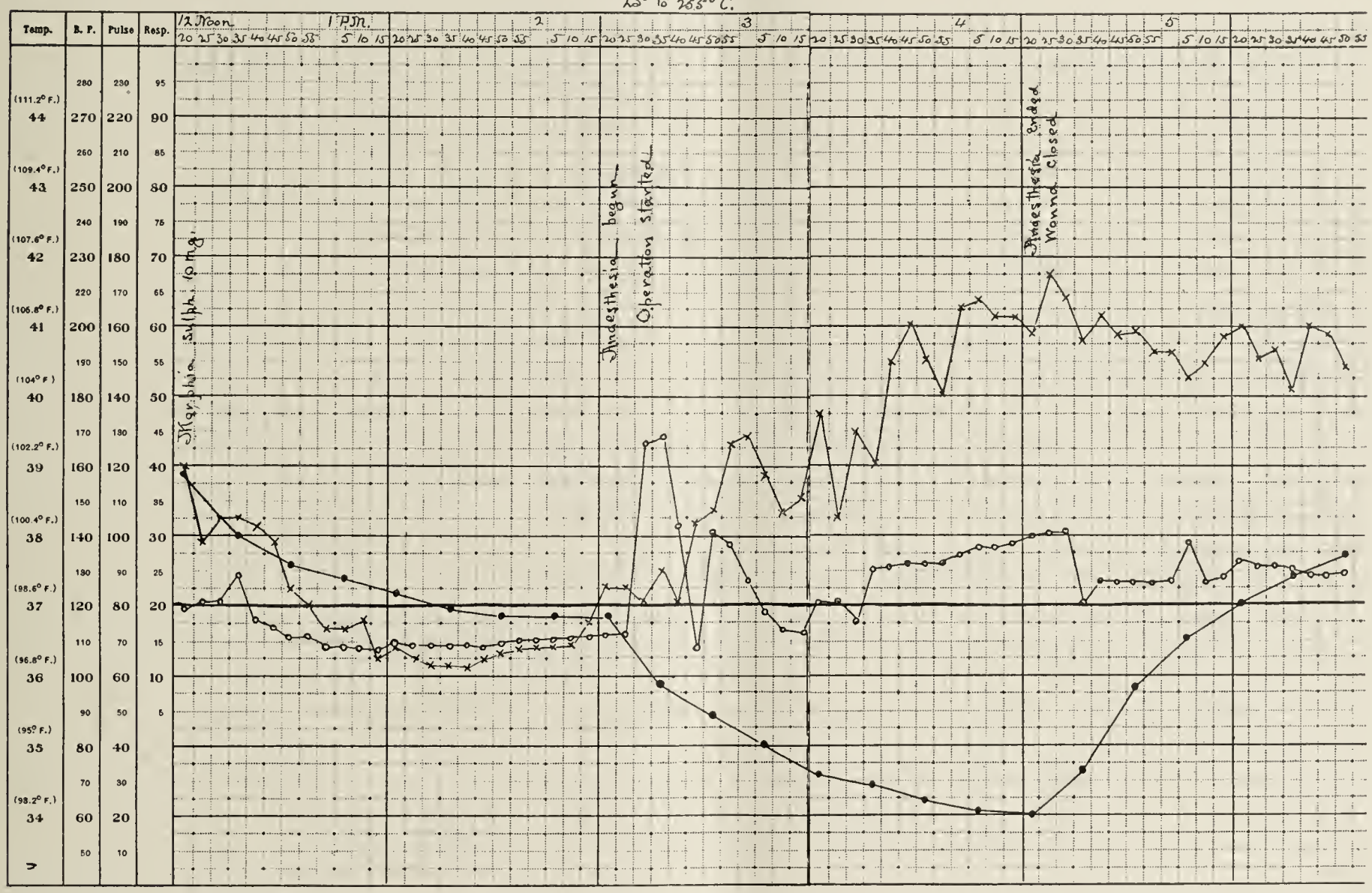


CHART 3.—Individual chart showing the curve of respiration, pulse rate and temperature as affected by a laparotomy on a dog under ether anæsthesia after preliminary administration of morphia. Note the fall in rate of pulse and respiration and the drop in temperature under morphia alone, and the immediate increase in the latter after administration of anæsthesia.

No. 5. Weight 6.5 kg. Temperature of room 25.5° C. The body temperature was 39° C. before the administration of ether and remained stationary for five minutes, when it commenced to fali rapidly. In fifteen minutes it had fallen to 38.2° C.; in half an hour to 37.6° C.; in three-quarters of an hour to 37.2° C.; in one hour to 36.9° C.; in one hour and a quarter to 36.6° C.; in one hour and a half to 36.2° C.; in one hour and three-quarters to 36° C.; in two hours to 35.8° C., and in three hours to 34.9° C.; making a total fall of 4.1° C. (7.4° F.). Fifteen minutes after ether was discontinued the temperature returned to 35° C.; in the next fifteen minutes there was a rapid rise to 36.8° C., and in the following fifteen minutes to 38° C., making a total rise of 3° in half an hour. Then for three-quarters of an hour a gradual rise

figures for the individual cases, with the average fall in fifteen minutes, are given in the following table:

	Before ether.	15 minutes later.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2¼ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 6....	38.7	37.5	36.8	36.1	35.6	35.2	34.8	34.2	?	....
No. 7....	39	38	37.5	36.8	36.4	35.8	35.5	35.1	35	34.7
No. 8....	38.8	37.1	36.7	36.5	35.8	34.5	34.4	34.2	34	....
No. 9 ...	38.2	36.8	36.1	35.8	35.5	34.6	34.4	34.1	34	33.6
No. 10....	38.6	36.5	36.2	35.5	35	34.5	34.2	33.9	33.3	33
No. 11....	39	37.4	36.9	36.5	35.5	34.9	34.4	34	33.8	33.5
No. 12....	39	38.5	37.8	37.1	36.7	36.5	36.3	35.9	35.8	35.7
Average.	38.8	37.4	36.8	36.3	35.8	35.1	34.8	34.5	34.3	34.1

(V) *The effect of ether and operation upon the temperature curve after preliminary morphia* (cf. Curve III, Chart 1 and Chart 2).

Observations were made upon twenty-five animals, weighing from 5.5 to 9 kg. The temperature of the room varied from 20° to 25° C. The body temperature in ten instances was taken immediately before the 16 mg. of morphia was given. The average was found to be 38.9° C. (102° F.). Two hours later the temperature had fallen to 36.6° C., making a total fall of 2.3° C. (1.14° F.) in two hours due to morphia alone. The greater fall under morphia before ether was administered in the temperature of the animals of this group over those of Group II is probably due to the fact that they were in colder surroundings.

A subsequent administration of ether with the preparations for and performance of an operation led to a further drop, as shown in the following table, making a total average fall of 4.81° C. (8.65° F.) in four hours, from the combined effect of morphia, ether and the operation.

	Before morphia.	2 hours later when ether was started.	15 minutes.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2¼ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 13....	38.8	37.2	37	36.8	36.5	36.2	35.8	35.6	34.8	34.6	....
No. 14....	39.2	36.5	36.3	36.2	35.7	35.2	?	....	....	....	....
No. 15....	....	36.8	36	35.3	35.2	35	?	....	....	....	....
No. 16....	...	37.3	36.8	36.2	36	35.8	35.2	35.2	?	....	....
No. 17....	39	35	34.7	34.4	34.2	33.8	33.3	33.1	32.8	32.3	32.3
No. 18....	39	36.8	36.5	36.3	35.9	35.7	35.6	35.4	35.3	35.3	....
No. 19....	38.6	36.4	35.8	35.6	35.4	35.2	34.7	34.3	34.2	34.2	....
No. 20....	..	37.7	37.2	36.4	35.2	35.1	34.8	34.7	....	....	....
No. 21....	....	37.2	36.1	35.6	35.1	34.3	33.8	33.4	33.2	....	....
No. 22 ...	....	37.6	36.6	36	35.4	35.1	34.8	34.4	34.2	33.8	33.3
No. 23....	38.7	36.2	35.4	35.2	35	34.8	34.5	34.3	34.1	34	...
No. 24....	39.2	36.7	36	35.2	35	34.5	....	....	33	....	....
No. 25....	39.4	34.8	34.8	34.8	34.7	34.6	34.6	34.5	34.5	34.4	34.2
No. 26....	....	36.5	35.8	34.9	?	....	....	....	....	....	....
No. 27....	....	37.6	36.7	36.0	35.1	?	....	....	....	....	....
No. 28....	....	36.8	36.5	36.1	36	35.8	35.7	35.6	35.5	35.5	35.1
No. 29....	38.6	36.8	36.4	36.4	36.2	36.1	36	35.8	35.6	35.6	35.6
No. 30....	....	37	36.4	36	35.5	35.4	35.1	34.8	?	....	....
No. 31....	....	36.8	35.8	35.4	35	34.6	34.4	34.2	34.1	34	...
No. 32....	....	35.9	35.5	35.2	34.9	34.8	34.7	?	....	....	....
No. 33....	....	35.8	35.3	35.1	34.7	34.8	34.7	?	....	....	....
No. 34....	....	36.2	35.9	35.4	34.9	34.4	?	....	....	....	....
No. 35....	....	37.2	36.6	36.2	35.7	35.5	35.2	34.9	34.6	34.4	?
No. 36....	....	36.3	35.8	35.3	35	34.8	34.5	?	....	....	....
No. 37....	38.8	36.6	35.4	34.8	34	33.7	33.4	33.2	33.1	33	....
Average.	38.9	36.6	36	35.6	35.2	35	34.8	34.6	34.2	34.2	34.1

(VI) *The effect of chloroform and operation upon the temperature curve after preliminary morphia.*

Observations made upon three animals: Weight not recorded. The average temperature of two of them before morphia was given was 38.8° C.; the subsequent individual and average fall is given in the following table:

	Before morphia.	2 hours later when chloroform was started.	15 minutes.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	2 hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 38.....	38.9	36.7	36.9	36.5	36	35.6	35.4	35	34.7
No. 39.....	38.8	36.6	35.9	34.4	34.1	?	...	....	....
No. 40.....	....	35.8	35.5	35.3	35	35	34.7	?	....
Average.....	38.8	36.4	36.1	35.4	35	35.3	35.2	35	34.7

(VII) *The effect of surrounding the field of operation with wet towels upon the temperature curve produced by ether and operation.*

In two abdominal operations under ether with the field of operation surrounded with wet bichloride towels, the temperature dropped from 39° C. to 32° C., making a total loss of 7° C. (12.6° F.) in two and three-quarter hours. The average fall is noted in detail in the following table:

	Before ether.	15 minutes after ether was started.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2½ hours.	2¾ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 41....	38.6	37.5	36.7	35.8	35	34.4	33.8	33.2	32.4	31.9	31.3
No. 42 ...	39.5	38.8	37	36.7	36.4	36.1	35.1	34.8	34	33.5	33.2
Average.	39	38.1	36.8	36.2	35.7	35.2	34.5	34	33.2	32.7	32.2

(VIII) *The effect of surrounding the field of operation with wet towels upon the temperature curve produced by morphia. ether and operation.*

In two abdominal operations in which 16 mg. of morphia had been given to the animals two hours before the administration of ether and the field of operation surrounded with wet bichloride towels, the temperature fell from 38.6° C. to 32° C., making a total loss of 6.6° C. (11.9° F.) in four and a quarter hours (two hours under morphia and two and a quarter hours under ether). The average fall is shown in the following table:

	Before morphia.	2 hours later when ether was started.	15 minutes.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2¼ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 43....	38.8	35.3	34	33.3	32.8	32.5	32.2	31.3	31	31	....
No. 44....	38.5	36.9	36.4	35.9	35.4	35.1	34.9	34.5	33.9	33.2	32.3
Average.	38.6	36.1	35.2	34.6	34.1	33.5	33.5	32.9	32.4	32	....

(IX) *The effect of the external application of heat upon the temperature curve produced by morphia alone.*

No. 45. Weight 5.4 kg; body temperature 38.3° C. Sixteen mg. of morphia were given and the animal allowed to remain in a cool room for fifteen minutes. During this time the body temperature fell to 37.6° C. The animal was then transferred to a room varying in temperature from 20° C. to 22.8° C., and confined in the dorsal position well protected with artificial heat applied externally. The temperature of the electric thermopyle was raised until a thermometer put under the animal's back registered from 50° to 52° C. The body temperature remained about stationary, with a slight inclination upward or downward, according to whether there was more or less heat applied. In two hours the artificial heat and coverings were removed. The temperature immediately began to fall, though the temperature of the room had meanwhile been increased to 22.8° C., and it continued to fall for one and a half hours until there was a loss of 0.8° C. It then remained stationary for half an hour. The animal was then released and the temperature slowly rose 0.7° C. in the next hour.

No. 46. Weight 7.4 kg.; body temperature was 38.5° C. After 16 mg. of morphia the animal was allowed to remain in a cool room for half an hour, the temperature falling meanwhile to 37.5° C. He was then transferred to a warm room, with a temperature of 22° C., where artificial heat was applied. The temperature made a gradual rise of 0.3° C. in 45 minutes. At this time the external heat was lessened and there was a corresponding fall of 0.3° C. during the following hour.

No. 47. Weight 6 kg.; body temperature 38.6° C. After 16 mg. of morphia in cold quarters a loss of temperature of 0.6° C. occurred in 15 minutes. The animal was then transferred to a warm room varying in temperature from 18° to 21° C. and con-

fined in the usual dorsal position. Artificial heat very imperfectly applied did not suffice to prevent the usual morphia fall.

The full details of these cases are noted in the following table:

	Before morphia.	15 minutes later when heat was applied.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2¼ hours.	2½ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 45....	38.3	37.6	37.7	37.7	37.6	37.6	37.6	37.6	37.6	37.4	37.2
No. 46....	37.5	36.5	37.6	37.7	37.8	37.7	37.7	37.7	37.5	37.5	37.5
No. 47....	38.6	38	37	36.8	36.4	36.1	36.1	36.2	36.2	36.3	36.4
Average.	38.5	37.7	37.4	37.4	37.3	37.1	37.1	37.1	37.1	37	37

(X) *The effect of artificial heat upon the temperature curve produced by ether alone* (cf. Curve I, Chart 1).

No. 48. Weight 9 kg. Patient confined on a table in the usual dorsal position with an electrothermal pad under his back, and well protected with blankets. An effort was made to force the temperature up by keeping the animal very warm and deeply anæsthetized. The temperature of the room was 25° C.; that of the electric pad varied from 44° to 52° C.

The body temperature before anæsthesia was 39.2° C.; in one-quarter of an hour 39.7° C.; in half an hour to 40° C.; in three-quarters of an hour 41.1° C.; in one hour 41.2° C.; in one and a half hours 41.3° C.; in one and three-quarters hours 41.5° C., making a total rise of 2.3° C. (4.14° F.) in one and three-quarters hours. At this point death suddenly occurred, possibly from an overdose of ether, though it is probable that the great increase of temperature was the chief factor.

(XI) *The effect of artificial heat upon the temperature curve produced by morphia, ether and operation.*

No. 49. Weight 7.4 kg. An abdominal operation under ether anæsthesia two and a half hours after 16 mg. of morphia had been given hypodermically; artificial heat applied and the patient well protected with blankets. The room temperature 24° C. Body temperature at the beginning of anæsthesia was 37.5° C.; in one-quarter of an hour 38° C.; in half an hour 38.2° C.; in three-quarters of an hour 38.5° C.; in one hour 38.9° C.; in one hour and a quarter 39.2° C.; in two hours 39.8° C.; then continued stationary for half an hour, but in two and three-quarters hours there was a slight fall to 39.2° C.; in three hours to 38.3° C.; in three and a quarter hours to 37.5° C.; in three and a half hours to 37.2° C.; in three and three-quarters hours to 37° C.

No. 50. Weight 6 kg. Abdominal operation under the same conditions as No. 49. Body temperature of the animal at the beginning of ether anæsthesia had fallen to 36.4° C. During the first hour and a quarter there was a slight rise followed by a fall of 0.5° C., owing to cooling of the heating apparatus. On removing the ether and artificial heat a gradual rise of body temperature occurred, amounting to 1.1° C. in one and a quarter hours.

	2½ hrs. after morphia, when ether was started.	15 min. after ether was started.	30 minutes.	45 minutes.	1 hour.	1¼ hours.	1½ hours.	1¾ hours.	2 hours.	2¼ hours.	2½ hours.	2¾ hours.	3 hours.	3¼ hours.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
No. 49..	37.5	38	38.2	38.5	38.9	39.3	39.8	39.8	39.8	39.2	38.3	37.5	37.2	37
No. 50..	36.4	36.2	36.4	36.5	36.4	35.9	36	36.2	36.4	36.7	37	...	...	..
Avg....	36.9	37.1	37.3	37.5	37.6	37.6	37.9	38	38.1	37.9	37.6	37.5	37.2	37

(XII) *The effect on the body temperature of warming the ether vapor before inhalation* (cf. Curve II, Chart 1).

The animals were confined (as in Group II) on the operating table in the usual dorsal position, unprotected, without morphia, and anæsthetized with warmed vapor of ether.

No. 51. Weight 8 kg. Temperature of room 26.6° C. The body temperature before anæsthesia was 38.9° C.; 15 minutes after anæsthesia it was 39° C.; in half an hour 39.2° C.; in three-quarters of an hour 39.3° C.; in one hour 39.4° C.; in two hours 40° C., and in three hours 40.6° C., making a rise of 1.7° C. (3.1° F.). For one hour after ether was removed there occurred a rapid loss of temperature amounting to 3° C. (5.4° F.), where it remained stationary for one hour, and then commenced to slowly rise.

No. 52. Weight 7.5 kg. Temperature of room 21° C. Body temperature before anæsthesia was 38.8° C. Under the anæsthesia the temperature remained stationary for three hours, when the anæsthetic was discontinued. During the next half hour the temperature dropped rapidly, reaching 38° C.; there it remained stationary for half an hour, and the observations were discontinued.

Animals that were being etherized under the usual conditions in the same room and at the same time showed the usual fall of temperature.

Clinical Observations.

For comparative purposes an effort was made in the surgical clinic to note the variations in temperature under the usual operating room conditions and to determine if possible whether the customary precautions were sufficient to prevent loss of temperature and whether postanæsthetic complications bore any apparent relation to such a loss. Observations were made upon one hundred and sixty-five patients in whom ether anæsthesia was produced by the open-drop method. The shortest period of anæsthesia in which the temperature was noted was thirty minutes, the longest four and three-quarters hours. Many of the operations were of a major type, such as osteoplastic craniotomy, hysterectomy, amputation of the breast, nephrectomy, cholecystectomy, etc.

The temperature, taken by rectum immediately before starting and immediately after the removal of the anæsthetic showed the average loss to be 0.51° C. (0.92 F.) varying from a rise of .77° C. (1.38° F.) after a four-and-three-quarters-hours anæsthesia for the removal of a cerebellar tumor, during which time the patient was kept dry and warm, to a loss of 1.66° C. (2.99° F.) after a one-and-one-half-hour anæsthesia for a simple appendectomy and unilateral oophorectomy, during which time the patient lay on a cold, rubber-covered table, the abdomen having been flushed with antiseptic fluids and covered with wet towels.

A number of these patients with postoperative subnormal temperatures have been followed to the wards, and even though surrounded by the usual heaters they are apt to complain of being cold when questioned soon after recovering from the anæsthetic. Though I have had no opportunity of following the body temperature of patients subjected to major operations under local anæsthesia, it is quite conceivable that, if they are given, as is customary, a preliminary hypodermic of morphia, and are subsequently kept wet during the operation, that a fall of temperature may occur under these circumstances just as in the laboratory experiments. Thus the postoperative pulmonary complications which are known to follow laparotomies or other operations under cocaine might be explained.

Of the 165 anæsthesias, 25 were for osteoplastic craniotomies, during which the patients were kept dry and well pro-

tected. The average loss of temperature in these instances amounted to 0.18° C. (0.32° F.) against a loss of 0.57° C. (1.02° F.) in the remainder, many of them being abdominal or thoracic operations with the patient more or less exposed and wet during the anæsthetization.

The temperature of the operating room was noted in one hundred and fourteen instances: twenty-one cases, etherized at a room temperature below 24.4° C. (76° F.) had an average loss of 0.75° C. (1.35° F.); thirty-one cases in a room with a temperature of from 24.4° C. to 26.6° C. (76° to 80° F.) had an average loss of 0.69° C. (1.24° F.); forty-nine cases with a room temperature of from 26.6° C. to 29.4° C. (80° to 85° F.) had an average loss of 0.35° C. (0.63° F.); fourteen cases with a room temperature of from 29.4° C. to 32.2° C. (85° to 90° F.) had an average loss of 0.26° C. (0.47° F.); three cases with a room temperature above 32.2° C. (90° F.) had an average loss of 0.07° C. (0.13° F.).

Sixty-five anæsthesias were produced by ether alone; two by the gas-ether sequence; ninety-three by the ethyl chloride-ether sequence, and five by the chloroform-ether sequence. The sixty-five anæsthesias produced by ether alone had an average loss of body temperature of 0.60° C. (1.10° F.); the ninety-three produced by the ethyl chloride-ether sequence had an average loss of 0.55° C. (0.99° F.). Thus the various methods of beginning the narcosis seem to bear only slight relation to the variation in body temperature.

The effect of warming the ether vapor before inhalation is very marked. In twenty-six patients anæsthetized by this method the loss of temperature averaged 0.16° C. (0.29° F.) against a loss of 0.57° C. (1.02° F.) in the one hundred and forty cases anæsthetized under similar operating-room conditions by the open-drop method. On noting the temperature before and after anæsthesia in eleven patients in whom the character of the operations necessitated the exposure of a large surface of the body, six were anæsthetized with warmed vapor, and their average loss of temperature was 0.43° C. (0.77° F.). The five patients anæsthetized under similar operating-room conditions by the open-drop method had an average loss of 1.1° C. (1.98° F.). This shows a difference of .67° C. (1.2° F.) in favor of warmed vapor over the cold anæsthetic.[9]

The results of these studies support the previous observations made by Kappeler, Allen and Mills, and justify the conclusions:

(1) That chloroform produces a loss of body temperature approximately equal to that produced by ether.

(2) That surrounding the field of operation with wet towels will very greatly increase the loss of body temperature and should therefore be studiously avoided.

(3) That the loss of temperature produced by ether narcosis will not be greatly increased by the preliminary administration of a moderate dose of morphia.

(4) That the excessive application of heat to an individual while under the influence of morphia will lessen the usual loss of body temperature from this drug, and that the additional administration of ether under these circumstances may lead to a rise in body temperature rather than the expected fall.

(5) That warming the ether vapor before inhalation will likewise prevent the loss of body temperature, or may actually increase it in a degree proportionate to the temperature of the vapor and also to that of the operating room. An undue

[9] The subject of warm anæsthesia is not a new one, for J. T. Clover, in 1873, devised a double current apparatus (Brit. M. J., March 15, 1873, pp. 282-283) in which the expired air served to warm the ether.

Hawksley (Brit. M. J., August 7, 1873, p. 177) placed the ether chamber in a vessel of water kept at a temperature of 100° F., the ether vapor being conveyed to the patient through a tube.

J. T. Clover (Brit. M. J., July 15, 1876, pp. 74-75) described a new apparatus for administering nitrous oxide gas and ether singly and combined. The ether chamber was constructed so as to fit in a vessel containing hot water, so that the ether would be kept at a temperature of 68° F., or 73° F. if the room were cold. He later improved upon this (Brit. M. J., January 20, 1877) by constructing a portable regulating ether inhaler with a closed hot water compartment.

George Foy (Anæsthetics, Ancient and Modern, p. 141) describes a nitrous oxide apparatus in which the gas is heated by passing through a closed chamber containing hot water, situated between the rubber bag and the face piece.

James T. Gwathmey (Med. Rec., New York, October 14, 1905; N. York State J. M., February, 1908, pp. 68-72; Am. J. Surg., July, 1908, pp. 212-214) has done much to show the advantages of warm anæsthesia over cold. He combined the good features of the Braun and Harcourt inhalers, making a three-bottled apparatus by which four different strengths of ether vapor could be given. The chloroform or ether vapor is forced through hot water which is placed in the third bottle. Dr. Gwathmey discarded this third bottle when he constructed his improved apparatus, and surrounded the remaining bottles (one for chloroform and one for ether) with a closed metal box containing thermolite.

H. Warren Buckler (Maryland M. J., April, 1908) uses an apparatus which consists of a small air pump run by an electric motor, which forces air in an ordinary air-water gasometer filled with very hot water. The stored air is heated and drawn off at will and passes through the ether chamber of a Clover inhaler.

Haun (München. Med. Wchnschr., November 14, 1907, Vol. LIV, No. 47) heated chloroform to 38° C., and then administered it by the drop method, and found it very advantageous. Many others likewise have heated both ether and chloroform by placing the container in a hot water bath and then administering the anæthetic by the drop method.

Many of these methods of warming anæsthetics are either inadequate or too complicated. The method that I have adopted is to convert the liquid anæsthetic into vapor and then heat the vapor to the desired temperature. This can be accomplished by any of the ordinary vaporizers, such as the Gwathmey, Souchon, Junker or Braun type, or by a simple vaporizer constructed out of a six- or eight-ounce bottle, the afferent tube extending well to the bottom of the bottle and the efferent tube only through the cork. In this way air is forced to the bottom of the bottle and bubbles up through the liquid anæsthetic on its way to the warming apparatus. This apparatus consists of an inner chamber with a capacity of about 300 cc., in which are coiled several feet of copper tubing. On the outer side of this chamber, which is filled with hot water, is a second chamber with a capacity of about 300 cc. This is filled with thermolite. This heater will continue warm for four or five hours without being reheated, and can be used for warming ether, chloroform or nitrous oxide gas. When attached to a Gwathmey vaporizer it makes a small, compact apparatus, which can be carried in an ordinary handbag.

elevation of body temperature from this source is doubtless injurious; the object should be to maintain an even temperature.

(6) That in a human patient kept warm and dry during anæsthesia the loss of temperature will be very much less than when the body is wet and exposed, and, furthermore, the fall in temperature is less under ordinary conditions of anæsthesia in a room with a temperature above 26.6° C. (80° F.) than in a room of a lower temperature.

(7) That patients consequently should not only be kept dry and warm, but should be anæsthetized in a room free from draughts and should not be transferred to a cold room even after the anæsthetic is discontinued.

(10) That with such profound variations in body temperature as have been observed, with many of the patients complaining of being cold even after they have been returned to their beds, it perhaps is not surprising that post-anæsthetic pulmonary complications are not uncommon.

POSTOPERATIVE PULMONARY COMPLICATIONS.

By John Homans, M. D., Boston, Mass.

Improvement in the methods of administering anæsthetics has accompanied, but has hardly kept pace with, the progress of surgery in general. Postoperative pulmonary complications continue to be of relatively frequent occurrence. The statistics from different sources, however, show great variability in this respect, and the questions naturally arise: (1) How far is the administration of an anæsthetic by inhalation responsible for these complications? (2) Are there other factors, in addition to the anæsthesia, of etiological importance? (3) Will a perfected technique and greater skill in administration serve to lessen their frequency?

This subject was brought forcibly before me by several cases which have occurred in the practice of Dr. M. H. Richardson, of Boston, to whom I am indebted for permission to study and publish them. They presented symptoms of extensive and sometimes multiple areas of dry pleurisy, and in one case, signs of consolidation of a whole lobe. These conditions were followed by pulmonary embolism or phlebitis, or both, in such a way as to make it clear that the earlier lesions were infarctions and had no actual relation to the anæsthetic. If such instances of obvious embolic infarcts occur, may not others, unrecognized, serve as the origin of pneumonia, abscess or gangrene?

The subject of the origin of postoperative lung complications has been vigorously discussed of late years in Germany. Figures taken from various German clinics show percentages of mortality due to this cause, after abdominal operations, varying from 0.56 per cent to 12.5 per cent. The mortality has been from 25 per cent to 60 per cent of the morbidity. The figures of v. Lichtenberg (1) are as follows:

Reference.	Number of Laparotomies.	Mortality due to Lung Complications. Per cent.
Körte (Bibergeil)	3909	3.5
Czerny	1302	3.9
von Angerer (Gebele)...	1196	6.43
Kümell (Grimm)	1754	2.5
von Mikulicz (Henle)...	1787	8.00
von Mikulicz (Kausch)..	1881	2.4
Krönlein	1409	0.56
Trendelenberg (Läwen).	1829	5.4
Lexer (Wolff)	976	12.5

Trendelenberg's (2) statistics show 1.8 per cent mortality from pneumonia for all operations, which contrasts with 5.4 per cent for laparotomies.

Other figures show that, with the exception of operations on the mouth and throat, these complications are most likely to follow abdominal operations, of which those on the stomach are by far the most prolific source, with operations on the gall-bladder and pelvic organs furnishing a fair proportion.

Operations.	Number of Cases.	Died.	Died of Lung Complications.	Percentage of all Deaths due to Lung Complications.
Stomach	2176	623(28.63%)	181(8.31%)	29.05%
Bile Passages.	1042	132(12.66%)	20(1.92%)	15.15%
Herniæ	1601	60(3.74%)	15(0.93%)	25.00%
Goitre	3526	34(0.96%)	15(0.42%)	44.00%
Gynecological	3280	257(7.83%)	50(1.53%)	19.45%

The mortality due to pulmonary disease following operations on the stomach is highest in cases of cancer, regardless of the nature of the operation. As to the relative frequency of lung complications following inhalation, as against local anæsthesia in these cases, it seems clear that while the morbidity is fully as high under local anæsthesia, the mortality is generally much lower. Concerning the character of the lesion found in the lungs, Bibergeil (3), in an analysis of 283 cases from Körte's clinic, found 98 cases of lobular pneumonia (25% fatal), 27 cases of hypostatic pneumonia, and 10 cases of lobar pneumonia (of which one showed multiple emboli in the pulmonary artery).

These rather meager figures present the variations in different clinics as well as the importance of the subject in general. More would be superfluous, in view of the fact that without analysis of the conditions under which the operations were performed, particularly with regard to the use of trained anæsthetists, and without bacteriological and autopsy findings, they add little to the accurate knowledge of the subject.

Taken as a whole, cases presenting postoperative disease in the lungs may be divided into those in which the exciting cause arrives by the air passages and those in which it arrives by way of the blood- or lymph-vessels. To the first class belong broncho-pneumonias, variously called ether, aspiration

or inhalation pneumonias. These form, or have in the past formed, the larger proportion of all cases. The following is a typical history:

R. C. C., a large, healthy man. *Operation:* Gastroenterostomy for an extensive duodenal ulcer. Morphia and atropine given before operation: anæsthetic started with gas and the ether given with cone: mouth and throat full of mucus during entire operation: breathing difficult.

Evening of same day, some cough, and following day, constant effort to raise sputum. Pulse 120; temperature 99.2° F.; respiration 26.

Second day after operation, marked cyanosis, labored breathing, abundant purulent sputum, coarse râles throughout both lungs, and dullness with bronchial breathing and fine râles in right lower back. Temperature 102° F.; respiration 25-30; pulse rapid and weak.

Third day, same condition, with signs of consolidation in lower left back. Lower temperature.

Fourth day, râles clearing up; temperature falling.

The consolidation cleared up in about a week after operation. The most acute period of the disease lasted about three days, during which time the patient appeared very sick.

This case, regarding it as one of broncho-pneumonia, would seem to be due primarily to the anæsthesia, for with each inspiration mucus had been drawn into the trachea from the mouth and pharynx in spite of efforts to drain the throat and allow free advent of air.

In connection with this aspect of the subject, it is desirable to sum up in more or less detail the results of experimental work done with the object of showing the effect of inhalation narcotics on the air passages and lungs. Work on the question of immunity or the want of it toward bacterial invasion during the administration of anæsthetics should be mentioned.

Offergeld (4) administered ether by several methods to guinea-pigs, rabbits and cats, and killing the animals at various periods after narcosis, studied the pathological changes in the lungs.

Giving ether alone by means of an apparatus which fitted the face in such a way as to allow only the air which entered through the apparatus with the ether to reach the bronchial passages—a "closed method"—and with a period of anæsthesia lasting from seventy to eighty minutes, he obtained the following results. Some of the animals died in several days, and showed at autopsy typical broncho-pneumonia. Others which seemed well, if killed in two or three days showed lungs nearly sound macroscopically but with some areas of induration, which, on section proved to be areas of broncho-pneumonia. In the finer air passages were found desquamation of epithelium, slight hæmorrhages, and fatty degeneration of epithelial cells; in the bronchi some desquamation and a little blood, mucus and pus.

Anæsthetized by an "ether-oxygen" method none of the animals succumbed, and they revived more quickly than after anæsthesia by ether alone. Some suffered from marked bronchitis on the first day, and if sacrificed at this stage showed small isolated patches of consolidation, a thickened and injected bronchial mucosa with some desquamation and extravasation of blood. In some instances the peribronchial tissues were involved.

Using the "open" or "drop" method, Offergeld obtained still more favorable results. There were no deaths from the anæsthetic. The animals were killed one to eight days after narcosis. The early conditions showed an injection of the submucous bronchial vessels with points of hæmorrhage; a slight disarrangement and very slight fatty degeneration of epithelial cells; a little mucus in the lumen of the bronchi; air only in alveoli; no fatty degeneration of alveolar cells. Autopsies after two days showed a normal condition with a disappearance of the fatty degeneration.

This is quite a contrast to conditions found after the "closed" methods where the destruction of epithelium required at least four days for repair in mild cases. The difference consisted in the formation of new cells to replace tissues destroyed in the "closed" anæsthesias as against regeneration of slightly injured tissues in the "open." But in experiments with frequently repeated narcosis by the "drop" method at intervals so short that regeneration had not time to take place, the same extreme degeneration and inflammatory change could be caused as in the "closed" methods.

Other experiments of similar character were performed by von Lichtenberg (5) with chloroform, and especially with chloroform and oxygen. He used guinea-pigs which, according to him, take any anæsthetic badly. He found very constantly atelectasis, emphysema, desquamation and hæmorrhage into bronchioles, often broncho-pneumonia.

Poppert (6) etherized dogs with fitted masks and concentrated ether vapor. Most of the animals were killed by the anæsthetic and showed constantly in the lungs hyperæmia, hæmorrhage and less often œdema. One animal was etherized on two consecutive days. It lay on the left side and inhaled much mucus and possibly vomitus, dying on the second day with typical broncho-pneumonia of the left lung. Poppert also experimented with ether and chloroform mixtures. He considered chloroform less dangerous than ether, and ether more harmful the greater its concentration.

Another line of investigation was pursued by Hölscher (7). He studied the secretion of mucus in the mouth and air passages of dogs and rabbits under both ether and chloroform anæsthesia, especially with relation to the amount and distribution of the inhaled mucus. If some easily traced coloring matter were placed in the mouth, and the animals killed during narcosis, the following facts became apparent: that if the mouth were not properly drained the mucus travelled to all parts of the lung—to the whole right lung if the animal lay on its right and to the left lung if on its left side; that increased violence of respiration due to obstruction in the throat caused increased inhalation of mucus; that with good drainage of the mouth (head hung over to one side) almost no mucus penetrated the bronchi; that the air passages were excited to slight hypersecretion which they themselves were capable of taking care of if not interfered with; that ether did not inhibit the movements of the ciliated epithelium; and

finally, that chloroform excited less secretion than ether. He considered that hypersecretion was due not only to local but also to central influences.

Still another consideration has a bearing on the influence of inhaled anæsthetics in the causation of pulmonary complications. This concerns the local resistance to bacterial invasion which exists in the lungs. Leaving aside the complicated question of how bacteria reach the lungs,[1] there seems to be no doubt of their existence there from time to time in greater or less numbers even in a state of health. Pneumonia has been produced in rabbits by the inhalation of dust particles and exposure to cold (11). Snel (12) experimented with guinea-pigs, which though susceptible to anthrax, do not become infected when virulent cultures are placed in the trachea. Ether or chloroform administered to animals so prepared caused death with dissemination of the anthrax bacillus through the lungs and other organs. Animals anæsthetized for only a short time did not succumb, and this was the case also if the anæsthetic was not given until an hour after the introduction of the organisms.

Observations of this kind are interesting in relation to cases of broncho-pneumonia of the type already mentioned. There is little or no doubt that improved technique in the administration of ether does much to reduce the frequency of these accidents, and precautions suggest themselves.

It would hardly be worth while to mention the many conditions generally accepted as favoring postoperative pneumonia if it were not that many of them have a bearing on still other sources of danger to the lungs. Old age, feeble heart action, arteriosclerosis, alcoholism and cachexia from any cause are contra-indications to operation as much with relation to the heart as to the lungs. A previous slight bronchitis, catarrh or emphysema is an obvious cause for stasis and auto-infection as has been shown by the statistics from Körte's clinic (2).

Among causes arising during operation are excessive cooling brought about by improper covering, by the use of cold fluids or gauzes in the abdomen, or by interference from the anæsthetic with the body's heat production. Loss of blood, wound infection, inhalation of mucus, and over-anæsthetization are other important considerations. Postoperative influences include too long rest in bed, enfeebled circulation, lack of proper lung movements due to a painful abdominal wound, too tight a swathe, or meteorism. These latter conditions have been long dwelt on as causes of pneumonia. It is said that many patients with epigastric wounds cannot raise the excess of mucus caused by anæsthetization and so accumulate septic material in the lungs. Hypostatic pneumonia, which ought perhaps to be classed with inhalation pneumonia, may be brought about as often in this way as by enfeebled circulation, pressure of the liver against the right lobe of lung, or any other of the causes to which insufficient acration is attributed.

Experimental observations such as I have described, considered in relation to these unfavorable conditions, might well account for many of the postoperative pulmonary complications. The striking contrast between the statistics of Krönlein and those of other German surgeons quoted in the beginning of this paper, is in strong support of this view. Krönlein (17a) during the period covered by his report, made use of an expert anæsthetist, who gave ether by the "open" method. He allowed practically no preparation of the patient on the table, doing away with the cooling from fluids and wet coverings. He shortened the period of anæsthesia by beginning the operation at the earliest moment permitted, seeing to it that the operator was ready before the anæsthesia was begun. I have no note of other precautionary measures or of the class of operations performed, but with only this information I should be willing to credit to Krönlein's system the pulmonary mortality of only 0.56 per cent—strikingly low as compared with the mortality in other clinics.

However much protection is afforded by efforts of this sort, there still remain operations of certain kinds which, even when performed under cocaine, are not infrequently followed by pulmonary disease. In these cases injury to the lungs by the anæsthetic is often out of the question. Are they to be regarded as due to the various favoring influences mentioned above, or are there more definite sources of injury to the lungs not connected with inhalation anæsthesia? Gastrectomies, gastroenterostomies, gastrostomies, abdominal injuries involving tears or contusions of bowel, and to a lesser degree, hernia-strangulations, are in a considerable percentage of cases followed by pneumonia.

Gottstein's figures (13) for cocaine operations from Mikulicz's clinic are as follows: Operations 212; abdominal 138; all other 74; of the 74 only one case (operation for hypertrophied prostate with purulent cystitis) led to pulmonary symptoms; of the 138, in 13 per cent postoperative bronchitis or pneumonia occurred. This percentage excludes all cases in which vomiting might have influenced the conditions and also those in which the symptoms appeared more than three days after operation. Henle's (14) figures from the same clinic show that while the pulmonary morbidity in stomach surgery (the principal cocaine operation) is as high with local as with general anæsthesia, the mortality with the former is distinctly lower.

As a cause for lung involvement after such operations, infection through the lymphatic system has been suggested. A number of cases are mentioned by Goebel (15) in support of this "lymphatic" hypothesis. In two of them a general anæsthetic was used, but the sudden onset of pulmonary symptoms is inconsistent with the ordinary type of "ether-pneumonia." Two others were performed under local cocaine injection.

Case I.—Healthy man; kicked in abdomen; four hours later resection of torn bowel under ether: in four hours more elevation of temperature and respiration; next day many areas of consolidation; death in eight days. Autopsy showed a diffuse process resembling croupous pneumonia. Wound and region of resection clean. No obvious embolism.

[1] Articles on the permeability of intestines to bacteria, and their transference to lungs (8), (9), (10).

Case II.—Gastroenterostomy for cancer. Ether. Practically the same results followed.

Case III, (16).—Man, aged 72: œsophageal stenosis; moderate emphysema and peripheral arteriosclerosis; cocaine; gastrostomy; pneumonia beginning on same day with dullness in lower right back. Death in one and one-half days. Autopsy showed croupous pneumonia of right middle lobe; no embolism; wound clean.

Case IV, (16).—Man, aged 56: œsophageal cancer; no cachexia; gastrostomy; cocaine; pneumonia on same day with consolidations scattered through both lungs; sputum on second day contained colon bacillus; recovery.

Other instances of pneumonia are cited in which the fluid in the sac of a strangulated hernia was found to contain the same organism as that isolated from the lungs.

Taking the above cases into consideration and having in mind the investigations on the permeability of the intestinal walls to bacteria and other foreign substances (8, 9 and 10), Goebel undertook to demonstrate an anatomically direct pathway from bowel wall to lung. He showed that insoluble coloring matters injected into the walls of the small intestine found their way through the lymph-vessels of the mesentery, the lymph-glands at its base, the thoracic duct and so to the lung. This process took place in a few hours. The same experiments were then carried out with tetragenus broth and cultures of *Bacillus prodigiosus,* and though the lungs were found infected in from one to twenty-four hours, the course of the organism could not be traced.

Kelling (17), in a paper read before the German Surgical Congress in 1905, points out other possible routes between the mesenteric or peritoneal lypmh stream and the lungs, particularly through the diaphragm and retroperitoneal systemic veins.

Though this lymph-stream hypothesis may explain what appear to be embolic processes, whose origin is presumably in regions where the portal circulation carries blood not directly to the heart but to the liver, embolism from the veins of the stomach may reach the lungs by anastomoses with œsophageal veins, and the veins of the lower intestine may communicate through rectal veins. Inflammatory processes about the appendix may start a thrombosis in retroperitoneal veins having a direct route to the lungs. Abdominal operations in such regions together with those on the uterus and adnexa may furnish a source of embolism (25) (26) and gross pulmonary embolism is too well known to require comment. But that lesser degrees may serve as a source of pneumonia is illustrated by the following cases which have occurred in the practice of Dr. M. H. Richardson:

Case I.—Anæmic woman; hysterectomy for fibroids; ether; uneventful convalescence until eighth day when "dry pleurisy" appeared in right side, accompanied by temperature of 101° F., rapid pulse and respiration. Symptoms disappeared after two days. A week later while patient was still in bed a thrombosis occurred in left thigh. Recovery. This appears to have been a case in which pleurisy was due to an infarct. The subsequent thrombosis in the leg was probably the sequence of the same process which caused the pleurisy.

Case II.—Uterine fibroids, cyst of broad ligament, complicating advanced abdominal pregnancy. Ether. Extensive pelvic operation with drainage. No sepsis subsequent to operation. Pneumonia on eighth day; elevation of temperature falling in several days with access of fever on twelfth day. As the patient was starting for home, sudden death occurred, with symptoms of pulmonary embolism. No autopsy. In this case the connection of the pneumonia with embolism is not proven, but the subsequent fatal embolism makes this seem a probable course.

Case III.—Woman with bad ischio-rectal abscess; thorough operation under ether; gauze packing; favorable convalescence, the temperature falling to normal in four days; on fifth day "dry pleurisy" in left back with signs of consolidation of lower left lobe; temperature of 102° F., becoming irregular later on, but always elevated; rectal wound clean and granulating well; same condition for six days when she suddenly died, supposedly of pulmonary embolism. No autopsy. Here again the conditions in the lung seemed to be independent of the anæsthetic—apparently a pneumonia or extensive infarct. Subsequent death from pulmonary embolism suggests embolic origin.

Case IV.—Middle-aged man. Acute perforative appendicitis with local abscess of several days duration; operation under ether; wound drained. Anæsthetic well taken and condition after operation favorable.

Second day after operation characteristic pain of dry pleurisy in right chest. Pain constant. Steadily rising pulse until fourth day when pulmonary embolism occurred; collapse; pulse high; temperature low; respiration 30-35. Patient remained in critical condition with frequent periods of partial collapse and difficult breathing until eleventh day when symptoms of "dry pleurisy" again appeared in the same side, the temperature running up to 102° F. Twentieth day phlebitis discovered in both legs. Twenty-third day death from pulmonary embolism. Autopsy by Dr. F. B. Mallory showed thrombi in both pulmonary arteries, the older, occluding all branches on the left and adherent to the walls, and the more recent occluding the right. In the right common iliac and femoral veins were found the thrombi from which embolism had occurred. A small retroperitoneal vein in the appendicular region was also thrombosed. No direct relation between the appendicular wound and iliac thrombosis was found. There was no evidence of infection. The right lung showed six or eight sharply defined infarctions with a fresh exudate on the pleural surface. The bronchi were empty. There was no œdema or exudate elsewhere. The report states that "the slight exudate in the lung and the organizing pneumonia were secondary to the infarction and probably some slight bronchial infection."

This case illustrates the course of a thrombosis giving rise to many small emboli, causing multiple infarctions and finally death from embolism. The original thrombus was not infected though it was found near an appendix abscess.

That thrombosis may be caused in intestinal vessels by handling, strangulation, or tying off veins, and that embolism will sometimes occur from this source has been shown often in animal experimentation (18) and (19); and Payr (20) has demonstrated that in some animals embolism from various parts of the portal circulation may reach the stomach and thence the lung. In fact, whatever the route, pulmonary embolism has been experimentally brought about in animals from sources within the portal circulation. I find no record, however, of an experimental pneumonia having been set up in this way.

In human beings embolic pneumonias undoubtedly occur, usually arising from thrombosis in systemic but possibly also in portal veins. There is simply a matter of degree and a

little infection thrown in between a harmless infarct, an embolic pneumonia, and a fatal pulmonary embolism. Certainly avenues of infection are furnished in cases in which an uninfected embolus reaches the lung. The air passages may play a part in introducing the organisms, or these may preexist in the field. On the other hand, that all infarctions, or even a majority of them, set up a pneumonia is far from the truth.

Recent statistics from v. Eiselsberg's clinic (26), collected with special reference to postoperative embolic processes, cover 6871 cases. Among these there were pulmonary complications in 263 (3.8 per cent). Of the 263 cases, 57 were of embolic origin. This number represents 0.83 per cent of all patients operated on and 21.6 per cent of those with postoperative disease in the lungs. Among these 57 cases were 23 of fatal pulmonary embolism, 20 of infarcts, and 14 of purulent embolic processes.

It is difficult to classify the diverse forms of postoperative pulmonary complications, but they may be grouped as follows:

I. Cases depending on narcosis, variously known as inhalation, aspiration or ether pneumonias; characterized by a general broncho-pneumonic process, purulent sputum, early appearance and short duration.

II. Cases of stasis in the lungs known as hypostatic pneumonias. These cases probably merge into the first and third classes but their characteristic is that they are caused by enfeebled circulation and inability to keep the lungs clear.

III. Cases depending on embolism, either from lymph-vessels or veins. If from the former, admitting the existence of such a process, the onset is sudden, and occurs soon after the operation. The disease resembles the lobar type. If from veins the pneumonia resembles the lobar type again but varies greatly. It appears when the circulation becomes active enough after operation to dislodge emboli from a thrombus. This class of case merges into the fatal embolism which generally occurs from the second to the fourth week and may include abscess or gangrene according to the severity, extent and character of infection of the process.

Against these accidents of surgery certain remedies readily suggest themselves. If heed is paid to a careful preparation of the patient, especially with regard to the good condition of the mouth, air passages and bowels; if operations of choice are only performed when the patient's circulatory system is at its highest point of efficiency; if operations of emergency, when the patient is not at his best, are conducted as rapidly and with as little waste of the vital energy as is consistent with efficiency, a local anæsthetic being used whenever it is of practical advantage, and if the most "open" method of inhalation anæsthesia, together with the smallest possible amount of the anæsthetic, is employed, the dangers from the first and second classes of lung complications will have been reduced to a minimum. Trained anæsthetists above all are to be desired. Certainly the quoted results from Krönlein's clinic (17a) obtained along these lines are far in advance of those published from other sources abroad.

As to the embolic class of cases, while there is much to be gained from these same precautions, yet it seems as if the technique of the operator with regard to injuries to tissues, the condition of the patient as regards sepsis and the individual predisposition to thrombosis must be cardinal influences. The present tendency to shorten rest in bed, with care and nursing calculated to keep the lungs and circulatory system in a high state of efficiency is an excellent one as avoiding danger of this sort. In this way massage and passive motion, as prophylactic measures, are useful weapons against thrombosis.

Careful study of such cases, especially the exact nature of the morbid process and the bacteriology, both in the living and in the dead will do much to clear up the subject. Many failures now regarded as unforeseen accidents may be prevented. "Unavoidable calamities" of surgery is a term which, however comforting to the surgeon, should be constantly limited in its application, and from under this head many cases of postoperative disease of the lungs should be eliminated.

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(27) Robb and Dittrick: Pulmonary Complications following Abdominal Operations. Surg. Gynec. and Obst., July, 1906, Vol. III, p. 51.

NOTES ON NEW BOOKS.

Ticks. a Monograph of the Ixodoidea. By GEORGE H. F. NUTTALL, M. D., etc., and CECIL WARBURTON, W. F. COOPER and L. E. ROBINSON. Part I, Argasidæ. Price 5/. (*Cambridge, England: University Press, 1908.*)

This first part of a work which is intended to deal with the classification, structure and biology of Ticks in extenso, with a full consideration of the previous work of others, promises to be a very interesting contribution to a field of medical zoology which is growing in importance daily. In this section, in addition to the thorough description of the various species of Argas, Ornithodoros, etc., with the life history as far as known, of each, much of which is based on original experiments and observations by the authors, there is in the biological section a very careful study of the relations of *A. persicus* and *A. reflexus* to spirochætosis in fowls, and the transmission of the spirochæta of African relapsing fever (*S. duttorii*) by *Ornithodoros monbata.* The rôle played by these ticks in the transmission of filaria and of bacterial infections is also discussed.

The make-up of the book is excellent as to type, paper and plates, and the extra index to the bibliography, arranged for transfer to card catalogues is a valuable innovation.

The remaining sections are to appear within a year and will be looked for with interest by all who are working in the related fields of medicine and zoology. T. R. B.

Diseases of the Skin and the Eruptive Fevers. By JAY FRANK SCHAMBERG, A. B., M. D., etc. (*Philadelphia: W. B. Saunders Company, 1908.*) Price, $3.

It is quite a pleasure to welcome this latest addition to the list of dermatological text-books. It is admirably adapted to the needs of medical students. The descriptions of the eruptions are so clear and concise that the appearance of a disease can readily be imagined. The facts about etiology and pathology are stated without verbiage. The arrangement of diagnosis of many of the diseases is excellent, the points considered being placed opposite one another in parallel rows under the names of diseases considered, so that differentiation can be more easily made. It is not, however, as complete as it might be. Treatment is given in a satisfactory manner, though methods and dosage are to some extent neglected. Occasionally faults are found; for instance, a bath of washing soda is recommended for the relief of urticaria. A special chapter describes the methods of actinotherapy and radiotherapy.

An abundance of excellent illustrations is the most attractive feature of the book. Experience has taught the publishers the value of illustrations in text-books on dermatology, and so they have been very liberal with their expenditures in this work. The photographs are well selected and show detail admirably.

Considerable space is given to the exanthemata, and the skin manifestations are exhaustively considered. In addition, mention is made of the various eruptions occurring in the course of typhoid and typhus fevers, cerebro-spinal meningitis, influenza, malaria, rheumatic fever, dengue, miliary fever, angina and tonsillitis.

However, the author should remember that all medical students are not so erudite as he is. For this reason such terms as *causa causans, contagium vivum, origo mali,* etc., are to be avoided. It takes too long to look for a translation, and so they are usually passed over or are misinterpreted.

The Baby. A Book for Mothers and Nurses. By DANIEL ROLLINS BROWN, A. B., M. D. (*Boston: Whitcomb & Barrows, 1908.*) Price, $1.00.

There is a surplusage of books on the care of babies, and this small one takes its place in the rank and file. It has no distinctive qualities to make it stand forth prominently. It is clearly and simply written, and can safely be put in the hands of those to whom it is dedicated.

Arteriosclerosis: Etiology, Pathology, Diagnosis, Prognosis, Prophylaxis, and Treatment. By LOUIS M. WARFIELD, M. D., etc., with an introduction by W. S. THAYER, M.D. (*St. Louis: C. V. Mosby Medical Book Co., 1908.*)

Dr. Thayer, in his introduction, emphasizes the laxity with which the term arteriosclerosis is made to cover many obscurities in diagnosis, and points out the great gaps in our knowledge as to its nature and causes. The book itself is a brief review of the subject of arterial disease treated rather from the standpoint of the practitioner than that of the pathologist. Although not profound, it will surely be found useful, especially in those chapters which deal with prophylaxis and practical suggestions as to treatment.

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COLLOID GLANDS (GOITRES): THEIR ETIOLOGY AND PHYSIOLOGICAL SIGNIFICANCE.[1]

By David Marine, M. D., and C. H. Lenhart, M. D.,
Cleveland, Ohio.

(From the Departments of Experimental Medicine and Pharmacology, Western Reserve University.)

Our object in this paper is to present certain data concerning the production, the anatomical and the physiological status of uncomplicated colloid glands (goitres). These observations have been made upon sheep's and dogs' thyroids, and though still incomplete, they tend to modify to some extent the generally held opinions as to the exact place in pathology which colloid glands should occupy.

Before taking up these data it may be well to mention briefly the great anatomical groupings that one has to deal with in establishing a point of departure for the study of the processes involved. These are four, viz: (1) Normal glands; (2) Colloid glands (goitres, all degrees); (3) Hyperplastic thyroids (all degrees); (4) Complications (engrafted on any of the three preceding groups). Barring *atrophies, neoplasms* and *infections,* all thyroids naturally fall into one or another of these four groups. Leaving out of consideration the last group (complications), for we are not concerned with them here, the anatomical characteristics of the remaining groups are well defined and generally known. (Johns Hopkins Hospital Bulletin, 1907, XVIII, 359.)

The literature dealing with colloid glands (goitres) is highly complicated, and for very sufficient reasons: First, it has dealt almost entirely with human material, and, as is well known, most operative specimens show one or more secondary changes (complications). It is due to this fact in particular that existing classifications of goitres include such terms as cystic, calcareous, fibrous, vascular, gelatinous, etc. These terms, it seems, should not be raised to primary importance since, as Virchow (Die krankhaften Geschwülste, III, 4) has pointed out, they are only examples of complications engrafted on a more fundamental type of change. Probably the essential reason why we do not find any very definite description of colloid glands (goitres) in the literature is because their comparative and experimental pathology has been but little developed and it is only in the lower animals that we are able to study uncomplicated forms in series.

In this discussion of colloid glands (goitres) we are using

[1] Presented in abstract at the meeting of the American Association of Pathologists and Bacteriologists, Ann Arbor, Mich., April 17, 1908.

the term "goitre" parenthetically for the following reasons: (1) In the older literature of human pathology other cervical enlargements than those of the thyroid have been described as goitre; (2) The term has been applied to a great variety of thyroid enlargements, viz: cysts, fœtal adenomata, malignant tumors and inflammatory swellings, etc.; (3) Goitre is primarily a clinical term; (4) There is a growing tendency, and rightly we think, to include under the term goitre the entire group of anatomical changes of which the major ones are those of the thyroid (hyperplasia) and lymphoid tissues (spleen, thymus and lymph glands). (Marie: Gaz. d. Hôp., 1893, 202; Hektoen: Internat. Med. Mag., 1895-6, IV, 584; Kocher: Arch. f. klin. Chir., 1908, LXXXVII, 131; Caro: Berl. klin. Wchnschr., 1907, XLIV, 519; Boit: Frankfurt. Ztschr. f. Path., Bd. I, 187; Hirschlaff: Deutsche Ztschr. f. klin. Med., 1899, XXXVI, 200; Hart: München. med. Wchnschr., 1908, LV, Nos. 13 and 14.)

Since thyroids frequently show quite marked degrees of hyperplasia without being noticeable clinically (the preclinical stage of goitre), and also since there may be distinct anatomical evidences of a previous active hyperplasia in a gland now rich in colloid, although the gland clinically or macroscopically is not enlarged, it might be confusing to use the word "goitre" unguardedly. Thus we include under the term colloid glands (goitres) all glands which show histological evidence of reversion from any degree of previous active hyperplasia irrespective of the size of the glands.

Brief mention has already been made in previous papers (Johns Hopkins Hospital Bulletin, 1907, XVIII, 359; Arch. of Int. Med., 1908, I, 349) of the incidence and nature of the anatomical changes that occur in thyroids undergoing active hyperplasia, one sequence of which is the production of colloid glands (goitres). We have called this change "reversion" because it seemed to us from the observed phenomena in animals that the changes were best interpreted as the return of the hyperplasia to a more normal type of gland.

The data which follow are presented somewhat in the order of their observation and will be discussed under the following headings: (1) Anatomical changes; (2) Age of the animals; (3) Inconstant changes following the removal of one lobe of the thyroid and the possibility of other factors than quantity of thyroid influencing thyroid changes; (4) More direct evidence of some additional factors determining thyroid hyperplasia, and reversion; (5) Effect of administration of iodin, the relation of iodin to gland structure, etc.; (6) Comparison of the general biological reactions of colloid and of normal glands; (7) The preventive effect of iodin on secondary hyperplasia; (8) Summary.

1. Anatomical Changes.

In the routine histological examination of seven hundred (700) dogs' thyroids several examples of colloid glands (goitres) were met with—some complicated, others in pure form. We also observed what appeared to us to be transitional forms, *i. e.*, forms partaking both of the characteristics of colloid glands (goitres) and of active hyperplasias. By arranging these in series with the pure colloids at one end, and the active hyperplasias at the other, the gradations could easily be traced step by step by means of certain common features. *First,* in all specimens there were infoldings and plications of the lining epithelium of the alveoli which in the pure colloid glands appeared as twigs covered with the flat cubical epithelium characteristic of that lining the alveolar walls proper. In the transitional forms these same infoldings and plications were covered with higher forms of epithelium ranging up to columnar, which also conformed to that of the ruling type of epithelial cells lining the alveolar walls proper. In the pure active hyperplasias the infoldings as well as the alveolar walls proper were always covered with columnar epithelium.

Secondly, the stainable colloid approaches nearest the normal type in the true colloid glands and gradually becomes paler, more vacuolated and granular as we pass through the transitional forms to the true active marked hyperplasias, where it is generally absent or nearly so.

Thirdly, the vascularity and condition of the vessels show distinct and graded changes from the comparatively very slightly vascular pure colloid glands up to the markedly vascular active hyperplasias, while the vessel walls in pure colloid glands show distinct obliterating endarteritis similar, histologically, to that occurring in the involuting uterus or thymus.

These gradations of anatomical changes in the epithelium, the colloid and the vessels are very striking in the dog where such a series of colloid glands is easily obtained (in goitrous districts).

2. Age of the Animals.

The factor of age is important. Our only series of thyroids in which sufficiently large numbers of naturally occurring colloid glands were found (dog and man) illustrate very strikingly that colloid glands occur in older animals while the active hyperplasias occur in younger animals. This has long been recognized however, and is implied in the commonly used term "colloid degeneration of" which also implies the existence of an earlier and different anatomical condition of the gland. This factor of age differences between colloid and hyperplastic glands is in itself evidence that, normally, colloid glands are derived from hyperplasias; but above all else it raises the question of whether this colloid change might not be interpreted as physiological as well as pathological.

In this connection some of our earlier experiments, undertaken to repeat Halsted's[1] work on compensatory hypertrophy of the thyroid, might be of value.

3. Changes Following the Removal of One Lobe.

As most of our dogs when admitted to the laboratory show some degree of active hyperplasia of the thyroid it occurred to us to remove but one lobe from each of a few animals and note

[1] Johns Hopkins Hosp. Rep., Balto., 1896, I, 373.

what occurred. All the lobes removed showed some degree of hyperplasia. The dogs were kept from 24 days to one year, and on examining the remaining lobe we found, instead of further hyperplasia in all, as expected, that in some cases the remaining lobe had reverted to the colloid state while in others the remaining lobe had undergone further hyperplasia.

These observations are presented in the following tables:

TABLE Ia.

No. of dog; sex; age; weight.	Date of first operation.	Date of second operation.	Lobe removed; weight of (gms.)	Histological classification of lobe.	Iodin per gram dried.	Iodin per gram fresh.
D-99a. male, middle, 8.4 kg.	29-I-06		Rt.; 7.2	Early gland. hyperplasia.	Not de	term'd.
D-99b.		16 I-07	Lt.; 4.5	Colloid.	1.538	0.458
D-85a, male, middle, 15.9 kg.	17 I-06		Rt.; 5	Early gland. hyperplasia.	Not de	term'd.
D-85b.		11-I-07	Lt.; 3.85	Colloid.	2.784	0.812
D-130a, female, middle, 9.6 kg.	14-II-06		Rt.; 1.9	Mod. gland. hyperplasia.	Not de	term'd.
D-130b.		30-X-06	Lt.; 1.5	Early gland. hyperplasia.	"	"
D-131a, male, middle, 9.7 kg.	14-II-06		Rt.; 6.9	Mod. gland. hyperplasia.	"	"
D-131b.		27-V-06	Lt.; 6	Mod. gland. hyperplasia.	"	"
D-207a, male, middle, 5.4 kg.	6-XII-06		Rt.; 2.1	Mark'd gland. hyperplasia.	"	"
D-207b.		27-I 07	Lt.; 1.6	Colloid–early gland. hyperplasia.	"	"

TABLE Ib.

No. of dog; sex; age; weight.	Date of first operation.	Date of second operation.	Lobe removed; weight of (gms.)	Histological classification of lobe.	Iodin per gram dried.	Iodin per gram fresh.
D-100a, male, middle, 11.81 kg.	29-I-06		Rt.; 2.4	Mod. gland. hyperplasia.	Not de	term'd.
D-100b.		9-I-07	Lt.; 1.9	Mark'd gland. hyperplasia.	0.171	0.045
D-175a, male, puppy, 8.4 kg.	25 IV-06		Rt.; 1	Mod. gland. hyperplasia.	Not de	term'd.
D-175b, 13.2.		25-I-07	Lt.; 1.05	Mark'd gland. hyperplasia.	0.135	0.029
D-208a, male, middle.	11-XII-06		Rt.; 3	Mod. gland. hyperplasia.	Not de	term'd.
D-208b.		4-I-07	Lt.; 3.5	Mark'd gland. hyperplasia.	"	"

Table Ia includes those cases in which reversion occurred in the remaining lobe, and Table Ib those cases in which further hyperplasia occurred. All these animals were kept in the same kennel, subjected to the same conditions, and clinically were in excellent health at the time of killing.

At first glance these observations seemed to us only a confirmation of the well known fact brought out by Halsted, viz: That if sufficient gland is not removed there is no compensatory hyperplasia of the remaining portion. However, on closer study there seemed to be more than this. In one group there was a reversion to a more normal type of gland while in the other there was further hyperplasia. All showed slight active hyperplasia of the first lobe removed, but the individual differences were slight. All were kept under similar conditions as far as possible. There were not sufficient differences in the size of the glands of the two groups or of the age of the animals to be of noteworthy importance, and we were forced to conclude that other factors than the amount of thyroid were concerned, not only in those cases where reversion occurred but also in those in which further hyperplasia resulted. Here are seen opposite histologic changes under apparently constant conditions. Is one pathological and the other physiological? We are inclined to look upon both as physiological in the sense that they represent the result of nature's attempts at establishing a normal condition. On this basis those cases which showed further hyperplasia easily become physiological (compensatory hyperplasia), but those cases which showed a colloid change (reversion) cannot be interpreted as physiological unless we suppose the existence of another factor than quantity of thyroid—some substance normally needed by the animal and whose presence or absence also has an influence on the cellular activities of the gland.

4. Thyroid Hyperplasia and Reversion.

In the light of this possibility that other factors than quantity of gland determine whether a gland already actively hyperplastic is to revert to the colloid state or undergo further hyperplasia the following observation is important: In the past two years we have from time to time removed small pieces of thyroid for histologic examination and then kept the animals for further experiments as needed. Looking over our records we find eight such cases. All were goitrous dogs and kept under the same conditions. Histologically the pieces of thyroids removed showed degrees of hyperplasia ranging from "marked" to "early-moderate." At the second operation, ranging from twenty days to three months later, it was found that the thyroids in all eight had undergone histologic changes toward colloid glands, *i. e.*, reversion—some only slightly, while others showed the completed changes to colloid. The dogs were all kept under the same laboratory conditions and liberally fed on cooked meat and bread. The problem is why these dogs, during their street life, maintained progressive hyperplasias while during their laboratory careers their thyroids, without exception, tended to revert to colloid glands. Certainly one thing seemed established, that some factor still unknown was influencing these gland changes, and from the clinical standpoint favorably, since the animals all gained weight.

5. Effect of Administration of Iodin, etc.

It was at this stage that we began to study experimentally the effects of iodin on the thyroid, thinking that further insight might be had by very careful comparisons of the histological structure with the iodin content. At any rate the question of iodin as a factor in these changes must either be more definitely established or eliminated, since clinically it has long been recognized as a specific remedy in the disease, and the work of Baumann, Oswald, Roos, Weiss, Hunt and others has established not only its normal presence in the

thyroid but that it is of the greatest significance in the physiological activity of the thyroid substance. Our earlier experiments with feeding iodin have shown that coincident with the administration of iodin to dogs with active thyroid hyperplasias there occurs a return to the colloid state which histologically is identical with the spontaneously occurring colloid gland. This change in the dog is complete in from 20 to 30 days if small doses of some iodin-containing compound (0.5 cc. syr. ferrous iodid) are administered daily during the period. Since then we have undertaken experiments for tracing this process step by step during the administration of iodin. Thus we have removed every 5-7 days a piece of the gland sufficient for histological control and iodin determination with invariably the following result: That as the gland histologically changed to the colloid state there was a corresponding rise in the iodin content. A typical case may be reported in full.

Case A-119.—Male, black mongrel, aged 8 months, admitted April 6, 1908. General nutrition good, weight 8 kg. Thyroid lobes are symmetrically enlarged and appear about the size of hen's eggs. They are soft, compressible, with a definite expansile pulsation and a palpable thrill. There is a palpable isthmus.

April 10, 1908. Under ether anæsthesia a portion of the left lobe was removed, weighing 9.825 gm.

There was slight hæmorrhage. Moderate distension of the lymphatic trunks coursing over the gland. Operation lasted one hour. Dog made excellent recovery.

Gross Description of Portion of Gland Removed.—The capsule is slightly thickened, gland tissue soft, grey-red, very vascular, and no visible colloid.

Histological Diagnosis.—Marked glandular hyperplasia.

Iodin content per gm. dry = 0.200 mgm.
" " fresh = 0.040 "

April 10, '08, gave 10 gtt. syr. fer. iodid by mouth.
" 11, " " 30 " " " " " "
" 12, " " 40 " " " " " "
" 14, " " 40 " " " " " "

April 15, under ether anæsthesia, the remaining portion of the left lobe was removed, weight 20.5 gm. The dog withstood operation well.

Gross Description of the Portion Removed.—Similar to first portion as described above except that there is some visible colloid and slighter firmness in consistency.

Histological Diagnosis.—Colloid—moderate glandular hyperplasia.

Iodin per gm. dry = 2.861 mgm.
" " fresh = 0.553 "

April 16. Dog in excellent condition, 40 gtt. syr. fer. iodid per mouth.

April 18. 100 gtt. syr. fer. iodid.

April 19. 100 gtt. syr. fer. iodid.

April 21. Bandages removed together with stitches. Healing per primam, 60 gtt. syr. fer. iodid.

April 22. Under ether anæsthesia a portion of the right lobe, weighing 1.5 gm., was removed. Immediately upon exposure of the gland it was noticeably different from the gland of previous operations in that it was much less vascular, firmer and translucent.

Gross Description of Portion Removed.—Capsule slightly thickened. Colloid is visible. Consistency moderately firm. Color is reddish-translucent.

Histological Diagnosis.—Colloid—moderate glandular hyperplasia.

Iodin per gm. dry = 4.078 mgm.
" " fresh = 0.860 "

April 23. Dog in good condition. (From this time on no iodin was administered.)

April 24. No sign of infection, eats heartily.

April 26. Wound clean, healed.

April 28. Under ether anæsthesia a portion of the right lobe weighing 7.2 gm. was removed. Dog withstood operation well, no hæmorrhage. The remaining portion of the gland has notably decreased in size.

Gross Description of the Portion Removed.—Gland is firm, colloid abundant, capsule moderately thickened, vascularity noticeably lessened.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 3.353 mgm.
" " fresh = 0.749 "

April 30. Slight œdema of jaw; otherwise in good condition.

May 3. Slight diarrhœa, wound healed and bandage removed.

May 6. Under ether anæsthesia a portion of the remaining part of the right lobe, weighing 6.5 gm., was removed. Rapid recovery from operation.

Gross Description of Portion Removed.—The gland tissue is hard, clear, yellow in color, colloid abundant, very viscid, vascularity normal.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 3.522 mgm.
" " fresh = 0.894 "

May 8. No swelling of jaw, no evidence of tetany; apparently both vocal cords paralyzed.

May 11. Wound healed per primam. Dog active, appetite excellent.

May 27. Condition excellent, fat, hair glossy.

June 1. Under ether anæsthesia a hurried examination failed to find the remaining part of right lobe, wound closed.

June 4. Stitches removed, wound healed.

June 15. Under ether anæsthesia the remaining portion of right lobe was found and part removed. After the operation had been completed the dog was killed by the careless administration of ether. An autopsy was immediately performed and the remainder of the right lobe, weighing 0.550 gm., was removed. There were two large accessory aortic thyroids, together weighing 0.750 gm. Their gross characteristics are the same as the portion of the thyroid lobe proper. Spleen and thymus slightly enlarged. Otherwise all the other organs were perfectly normal, both gross and microscopically. Weight of dog, 11.9 kg.

Gross Description of Thyroid Removed at Autopsy.—Colloid abundant, color clear yellow, firm to the touch, and of normal vascularity.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 2.770 mgm.
" " fresh = 0.554 "

Summary.—The dog was under observation from April 6, 1908, to June 15, 1908—70 days, during which time six operations were performed consisting of the successive removals of portions of the thyroid and accompanied by the administration of moderate doses of syr. fer. iod. for a period of 12 days following the first operation. After this the dog got no iodin except what might have been obtained from a liberal diet consisting of cooked meat, bread, water and milk. Ar-

ranging the iodin contents and histological diagnoses of the portions of thyroid in the order of their removal, we have:

	Histological Diagnosis.	Iodin per gm. fresh, mgm.	Iodin per gm. dried, mgm.
1st operation.	Marked glandular hyperplasia	0.040	0.200
2d "	Colloid—moderate-marked ..	0.553	2.861
3d "	Colloid—moderate	0.860	4.078
4th "	Colloid—early	0.749	3.353
5th "	Pure colloid	0.894	3.522
6th "	Pure colloid	0.554	2.770

This case illustrates the rapidity with which iodin is taken up by the hyperplastic thyroid and the rapidity of the process of reversion as well. The dog grew rapidly, gaining in the 70 days 4.9 kg.

As the histologic appearances of the spontaneously occurring colloid glands are identical with those artificially produced by administration of iodin, and since the histologic characteristics of colloid glands so closely resemble those of the normal glands, it becomes of interest to compare the iodin contents of normal and of spontaneously produced colloid glands. It suffices here to state that such comparisons have been made, and they show that the iodin contents of these two groups are practically parallel, and that the iodin contents of colloids are also the nearest approach to those of normal glands with which one meets. Indeed they may equal those of normal glands.

Thus far we have considered anatomical and chemical characteristics of colloid glands, both those artificially produced and the spontaneously occurring ones, and have compared the findings with those of normal glands. In a sentence, it was found that colloid glands, both as regards their histological characteristics and iodin contents, were the nearest approach to the normal gland that is possible for actively hyperplastic thyroids.

6. Comparison of Biological Reactions of Colloid and Normal Glands.

Next in order, we undertook studies of the *biological characteristics* of colloid glands as compared with those known to be true of normal glands. First, we took colloid glands, and from time to time removed parts in the attempt to produce compensatory hyperplasia of the remaining part, just as occurs in the similar treatment of normal glands. The following case is illustrative:

Case A-106.—Middle-aged female, white, bull-terrier. Admitted June 1, 1907, in excellent condition, weight 11.8 kg. Physical examination revealed symmetrical enlargement of both thyroid lobes, each lobe roughly measuring 5x3.5 cm. Definite isthmus palpable. Lobes firm, hard and quite freely movable. Clinical diagnosis of pure colloid goitre was made on basis of excellent general condition and the firm, hard, non-pulsating lobes of thyroid.

June 5, 1907. Under ether anæsthesia right lobe was removed, weight 29.5 gm.

Gross Description.—Capsule 1 mm. thick, of dense white fibrous tissue. Gland tissue on section is clear brownish-yellow (old hæmorrhages), with abundant colloid, white fibrous trabeculæ are prominent throughout. Specimen saved for iodin determination and histological examination.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 0.308 mgm.
" " " fresh = 0.033 "

June 18, 1907. Wound healed per primam, bandage removed, dog in excellent condition, appetite good.

July 15, 1907. Under ether anæsthesia about one-half of the remaining left lobe was removed, weight 15 gm.

Gross Description of Part Removed.—Capsule thick, color and colloid much the same as the previous portion of the gland.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 0.554 mgm.
" " " fresh = 0.066 "

August 15, 1907. Dog in fair condition, wound healed, weight 9.52 kg.

September 10, 1907. Under ether anæsthesia about one-half of remaining half of left lobe removed, weight 3 gm. Specimen saved for iodin and histological examination.

Gross Description.—Quite vascular, bright red, moderately firm, some visibly dilated lymphatic trunks, some visible colloid.

Histological Diagnosis.—Colloid—moderate glandular hyperplasia.

Iodin per gm. dry = 0.554 mgm.
" " " fresh = 0.099 "

September 20, 1907. Dog in fair condition, wound healed.

December 7, 1907. Under ether anæsthesia remaining portion of left lobe was removed (as nearly as possible, since fibrous adhesions made it practically impossible to remove all traces of lobe).

Gross Description of Portion Removed.—Weight 4.5 gm., color bright red, soft, visible fibrous trabeculæ, capsule much thickened, quite vascular, some visible colloid.

Histological Diagnosis.—Marked glandular hyperplasia.

Iodin per gm. dry = 0.115 mgm.
" " " fresh = 0.022 "

December 11, 1907. Dog has ravenous appetite. On removing bandage slight skin infection noted, washed with $HgCl_2$ and dressed.

December 22, 1907. Wound healed. Dog still has ravenous appetite; given sulphur bath on account of beginning mange.

January 4, 1908. Dog very weak, emaciated, weight 9.1 kg., slight diarrhœa, with visible cardiac impulse that shook the dog. Dog has showed no signs of tetany. As the dog was rapidly becoming weaker, in spite of its good appetite, it was decided to administer small doses of iodin in the form of syr. fer. iod.; beginning January 4, 10 gtt. daily was given. At first the dog seemed to improve, and between January 4 and 18 gained 2.3 kg.

January 21, 1908. Dog died suddenly this afternoon; was not seen at time of death. Autopsy (probably one hour after death) showed that the increased weight was due to œdema of the fatty tissues. Both thyroid lobes were absent. The heart was enlarged and dilated, especially the right side. Pulmonary congestion and œdema. Stomach, liver, kidneys, brain and pituitary body normal in their gross appearances. There was quite a large mass of thymus tissue in the sub-sternal fat, and also two accessory thyroids. These two accessory thyroids weighed 0.95 gm. In their gross appearance they were soft, greyish-red and vascular.

Histological examination of the accessory thyroids showed a moderate glandular hyperplasia.

Iodin per gm. dry = 0.410 mgm.
" " " fresh = 0.095 "

A histological examination and iodin determination were made on the thymus gland with the following result:

Histological examination revealed the presence of numerous duct-like spaces lined by columnar epithelium, and containing desquamated epithelial cells and a pink staining albuminous material (a condition common to about 20 per cent of the dogs in this locality). One accessory parathyroid was found in the thymus upon histological examination.

Iodin per gm. dry = 0.018 mgm.
" " " fresh = 0.006 "

Summary.—Dog was under observation from June 1, 1906, to January 21, 1907, practically seven months. During this time parts of the thyroid were removed on four different occasions. The first and second specimens were histologically pure colloid, while the third and fourth specimens removed showed, respectively, colloid with moderate, and colloid with marked glandular hyperplasia.

The iodin determinations of these four specimens showed, roughly, a decrease in the iodin content, proportional to the degree of hyperplasia. The accessory thyroids, removed postmortem, while showing histologically a moderate glandular hyperplasia, showed a noticeable increase in their iodin contents over the last operative specimen. This was probably due, as was also the presence of iodin in the thymus, to the feeding of iodin during the last two weeks of life. The presence of iodin in the thymus was not due to the presence of accessory thyroids, a possibility suggested by Cunningham and Mendel (Am. J. Physiol., 1900, III, 285). The noteworthy increase in body-weight during the last three weeks might be interpreted as of myxœdematous origin, although there is no positive anatomical basis for such an opinion, even though both thyroid lobes had been removed.

In this case it is clearly seen that a compensatory change occurred following partial excision. The change is identical with that which occurs in the normal gland, and has been admirably described by Halsted, *i. e.*, the flattened cubical cells lining the enlarged alveoli increase in size, first cubical, then low columnar, then high columnar, together with a lessening and finally a disappearance of the stainable colloid, and at the same time a marked increase in vascularity. The change is as a rule not quite uniform as some alveoli contain densely staining colloid and flattened epithelium, while all the surrounding alveoli have undergone true hypertrophy.

Thus it seems highly probable that colloid glands react like normal glands in the experiments of their partial removal.

7. Preventive Effect of Iodin in Secondary Hyperplasia.

Continuing along this line of biological experiments, it is known that the administration of iodin will prevent the occurrence of compensatory hyperplasia following partial excision in normal glands which otherwise would hypertrophy. The following cases are illustrative of what occurs in the normal glands.

Case A-26.—Female puppy, age three months, admitted February 10, 1907, weight 2.4 kg., in fair condition, no palpable thyroids.

February 15, 1907. Under ether anæsthesia, right lobe removed, weight 0.24 gm.

Gross Description.—Capsule thin, delicate, color reddish-translucent, visible colloid normal, firm consistency.

Histological Diagnosis.—Normal thyroid.

Iodin per gm. dry = 2.300 mgm.
" " " fresh = 0.380 "

February 19, 1907. Dog in excellent condition, wound healed, bandage removed, weight 2.4 kg.

February 21, 1907. Beginning to-day 1 gtt. saturated alcoholic solution of iodin was daily administered with its ration, for 15 days, ending March 8, 1907. From this date on no iodin was given.

March 20, 1907. Dog growing rapidly, clinically in excellent condition.

April 2, 1907. Killed with chloroform this morning, weight 4 kg.

At autopsy remaining lobe (right) weighed 0.305 gm., color clear, reddish-yellow, colloid abundant, gland tissue firm, capsule thin and delicate.

Histological Diagnosis.—Normal thyroid.

Iodin per gm. dry = 3.467 mgm.
" " " fresh = 0.705 "

The fat deposits were normal. Spleen, kidneys, liver, lungs, heart and brain were normal in gross appearance.

Case T-25.—Female pup, aged 112 days, weight 1.8 kg., excellent condition (reared in laboratory).

September 6, 1907. Operated upon and the left lobe removed. Weight 0.350 gm. Normal in gross appearance, and also upon microscopic examination. No iodin determination.

September 11. Wound healed, bandage removed.

October 30. Weight 2.6 kg., excellent condition, killed by another dog. Right lobe removed and at autopsy weighed 0.355 gm.

Gross Appearance.—Soft, vascular.

Microscopic Diagnosis.—Moderate glandular hyperplasia. No iodin determination.

This case (T-25) illustrates what usually occurs in young dogs with normal glands following the removal of one lobe, viz: compensatory hyperplasia of the remaining lobe; and Case A-26 shows that this compensatory hyperplasia may be prevented by the administration of iodin although the thyroid increases in size in proportion to body weight. These cases, with many other similar experiments, also suggest that hyperplasia accompanied by a disappearance of the colloid and a change to columnar epithelium is not a part of the normal growth of a normal gland.

While we have no separate experiments on colloid glands to parallel the above cases, there have occurred several cases which indicate the same to be true for colloids, viz: That in the presence of full amounts of iodin smaller amounts of colloid gland suffice to supply the animal's needs. This being true it is obvious that by withholding iodin the hypertrophic changes may be hastened. At first a diet as free from iodin as possible was considered, and indeed attempted, but it is fraught with so many difficulties (well stated by Dochez, Johns Hopkins Hospital Bulletin, 1908, XIX, 235), chief among which is that we may be depriving the animal of other substances necessary to its normal economy in the attempt to eliminate iodin, that we chose merely to use a raw meat diet (beef). As will be brought out more fully in a later publica-

tion the restricting of iodin does hasten the occurrence of hypertrophy both in normal and in colloid glands.

The following case, since it combines several of the points just mentioned, may be reported in full:

CASE A-121.—Male, middle-aged fox-terrier, good condition, weight 7.3 kg. Admitted April 20, 1908. Thyroid lobes are symmetrically enlarged, joined by a palpable isthmus and roughly measuring 5x2.5 cm. The consistency is moderately firm; there is a definite, though slight, expansile pulsation; no thrill.

April 22, 1908. Under ether anæsthesia a part of the right lobe, weighing 4.6 gm., was removed. Dog withstood operation well.

Gross Description of Specimen Removed.—The capsule is somewhat thickened; vessels distinctly enlarged, color yellowish-opaque, consistency moderately firm and colloid is barely visible, as are the whitish ring-like outlines of the enlarged alveoli.

Histological Diagnosis.—Colloid—moderate glandular hyperplasia.

Iodin per gm. dry = 0.269 mgm.
" " " fresh = 0.059 "

April 24, 1908. Dog is in excellent condition.

April 26, 1908. Bandage removed, no evidence of infection. Dog does not seem quite normal, appetite poor.

April 28. Under ether anæsthesia another portion of the right lobe, weighing 7.6 gm., was removed. Excellent recovery.

Gross Description.—Same as first specimen.

Histological Diagnosis.—Colloid—moderate glandular hyperplasia.

Iodin per gm. dry = 0.455 mgm.
" " " fresh = 0.099 "

April 30, 1908. Slight œdema of jaw, appetite good.

May 8, 1908. Wound healed, dog in perfect health.

May 9, 1908. Under ether anæsthesia the remaining portion of the right lobe was removed, weighing 6.4 gm. Excellent recovery.

Gross Description.—Gland much firmer than previous specimens, has a distinct yellowish translucent appearance and more visible colloid, vascularity still above normal. The enlarged alveoli are more distinct.

Histological Diagnosis.—Colloid — early moderate glandular hyperplasia.

Iodin per gm. dry = 0.692 mgm.
" " " fresh = 0.167 "

May 11, 1908. Wound in good condition, dog has good appetite.

May 20, 1908. Wound perfectly healed.

May 21, 1908. Under ether anæsthesia a portion of the left lobe, weighing 3.6 gm., was removed. Dog made excellent recovery.

Gross Description.—There are scattered areas of brown pigmentation (old hæmorrhage), colloid normal, vascularity still slightly above normal. The enlarged alveoli are more distinct.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.838 mgm.
" " " fresh = 0.520 "

May 27, 1908. Dog in excellent condition, wound healed.

June 2, 1908. Under ether anæsthesia another portion of the left lobe, weighing 1.2 gm., was removed. Large quantities of ether had to be used, and there was excessive bronchial secretion, otherwise the dog withstood the operation well.

Gross Description.—Colloid abundant, color clear, yellow, translucent, tissue firm, vascularity normal.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.774 mgm.
" " " fresh = 0.446 "

June 3. Dog in good condition.

June 8. Bandage had slipped and dog had scratched skin wound open, wound granulating, no pus.

June 12. Wound healed. Under ether anæsthesia another portion, weighing 4.85 gm., was removed. Dog made excellent recovery. Large quantities of ether necessary.

Gross Description.—Colloid abundant, yellow, translucent in color, tissue firm, normal vascularity.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.427 mgm.
" " " fresh = 0.369 "

June 16. Wound healed, stitches removed, dog in excellent condition.

June 27. Under ether anæsthesia removed another portion of the left lobe, weighing 4.2 gm. Dog made good recovery, some difficulty was encountered with mucus.

Gross Description.—Colloid abundant, color translucent yellow, tissue firm, vascularity normal. Outline of enlarged alveoli distinct.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 2.170 mgm.
" " " fresh = 0.550 "

July 2. Stitches removed, wound healed.

July 3. Mange suspected on account of some cutaneous irritation. An ointment of sulphur and lard was applied.

July 10. Dog in excellent condition. Under ether anæsthesia another portion of the left lobe, weighing 2 gm., was removed. Dog made excellent recovery from operation.

Gross Description.—Gland similar to last specimen described.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.091 mgm.
" " " fresh = 0.188 "

July 11. A prophylactic dose of 1 cc. of a 5 per cent solution of calcium chloride was given with food, although there was no evidence of tetany.

July 14. Calcium chloride stopped. Dog in excellent condition.

July 18. Wound healed. Dog in excellent condition.

September 1. Dog in excellent condition, has gained in weight, now weighs 9.5 kg.

September 13. Under ether anæsthesia another portion of the left lobe was removed, weight 0.5 gm. Aside from large amount of ether necessary, and excessive bronchial secretion, dog withstood operation well.

Gross Diagnosis.—Tissue more vascular than in previous specimen, visible colloid distinctly less. The cut surface shows fine greyish trabeculæ, giving the specimen a distinct opacity.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.082 mgm.
" " " fresh = 0.206 "

September 15. Dog in excellent condition; used sulphur ointment again.

September 19. Wound healed, stitches removed.

October 3. Dog apparently normal, given 20 gtt. syr. fer. iod. by mouth.

October 25. Finished the course of 15 cc. syr. fer. iod. by mouth.

November 1. Under ether anæsthesia a part of the remaining portion of the left lobe was removed, weighing 0.8 gm. The

scar tissue was moderately dense about it, but no difficulty was met with and dog rallied quickly from operation.

Gross Description of Specimen Removed.—Scar tissue at one edge is quite vascular, color of gland is clear, reddish-translucent, consistency firm, colloid normal. The alveoli are distinct.

Histological Diagnosis.—Pure colloid gland (goitre).

Iodin per gm. dry = 1.925 mgm.
" " " fresh = 0.513 "

November 2. As the operation injury to the tissue approached very near to the upper pole, and hence there was danger of having injured the presumably only remaining parathyroid, it was deemed advisable to give 10 cc. of a 5 per cent solution of calcium chloride as a prophylaxis.

November 4. 10 cc. of calcium chloride given; no evidence of tetany.

November 5. Wound healed. Stitches removed.

November 17. Dog very fat, weight 12.1 kg., active and alert.

December 21. Dog in excellent condition.

December 22. Under ether anæsthesia a part of the remaining portion of the left lobe was removed, weighing 0.355 gm.

Gross Description.—Color brownish-red, colloid visible, though reduced, vascular.

Histological Diagnosis.—Colloid—early glandular hyperplasia.

Iodin per gm. dry = 1.540 mgm.
" " " fresh = 0.305 "

December 26. Wound healed, stitches and bandage removed. Calcium chloride stopped. Weight, 12 kg.

In this case at the time of admission the thyroid was classified as colloid—moderate glandular hyperplasia, in which the histological picture was that of a spontaneous slow reversion from an active hyperplasia rather than that of a colloid gland undergoing further hyperplasia. We have summarized the experiment in the following tabulation:

SUMMARY.

Date of Operation.	Histological Diagnosis.	Iodin per gm. dry, mgm.	Iodin per gm. fresh, mgm.
April 22, '08.	Colloid—moderate glandular hyperplasia	0.269	0.059
April 28, '08.	Colloid—moderate glandular hyperplasia	0.455	0.099
May 9, '08.	Colloid—early glandular hyperplasia	0.692	0.167
May 21, '08.	Colloid—early glandular hyperplasia	1.838	0.520
June 2, '08.	Colloid—early glandular hyperplasia	1.774	0.446
June 12, '08.	Colloid—early glandular hyperplasia	1.427	0.369
June 27, '08.	Pure colloid gland	2.170	0.550
July 10, '08.	Colloid—early glandular hyperplasia	1.091	0.188
Sept. 13, '08.	Colloid—early glandular hyperplasia	1.082	0.206
Nov. 1, '08.	Pure colloid gland	1.925	0.513
Dec. 22, '08.	Colloid—early glandular hyperplasia	1.540	0.305

Thus, in a single experiment, starting with active hyperplasia we have followed the process back to colloid; to hyperplasia again; back to colloid, and finally to hyperplasia for the second time.

8. Summary and Discussion.

In the observations above recorded the following points were brought out:

(1) Colloid glands are in all their anatomical characteristics the nearest approach to normal glands that active hyperplasias can become.

(2) There are as many degrees and sizes of colloid glands as there are degrees and sizes of actively hyperplastic glands.

(3) There are all gradations from colloid glands to active hyperplasias.

(4) The iodin contents of colloid glands are the nearest approach to those of normal glands that it is possible for glands to attain to, which have once been the seats of active hyperplasia.

(5) Spontaneously occurring colloid glands are most frequently found in the well nourished and middle-aged animals.

(6) Colloid glands are known to occur from spontaneous reversion of hyperplasias or following the administration of iodin-containing substances to animals with hyperplasia, and in either case the resulting condition (colloid) is histologically the same.

(7) Partial removal of colloid glands is followed by the same compensatory hyperplasia as occurs in normal glands following their partial removal.

(8) The administration of iodin-containing substances will prevent the occurrence of secondary hyperplasia in colloid glands to the same extent that it prevents the occurrence of hyperplasia in normal glands following partial removal.

(9) It is possible by means of partial removals together with withholding and giving iodin to follow the process of reversion to a colloid gland; the process of compensatory hyperplasia, and the second process of secondary reversion in the same dog.

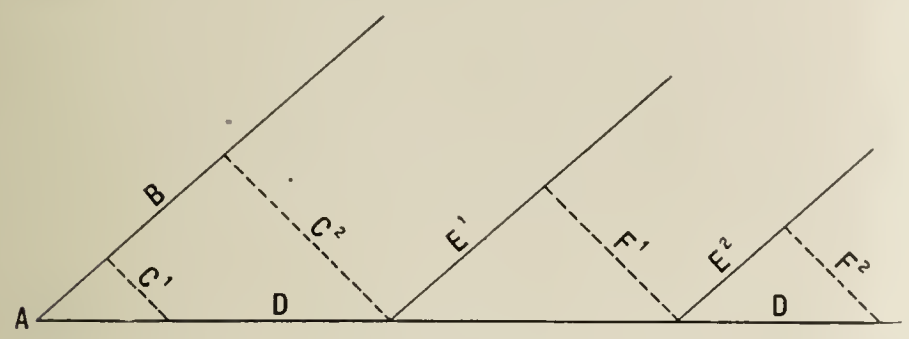
Thus it is seen that colloid glands as regards their *anatomical, chemical* and *general biological* characteristics obey all the laws of normal glands in so far as these laws are at present known.

These observations offer a rational explanation for the long known and ill understood phenomena of a goitre presenting some of the characteristics both of a colloid and of a hyperplasia (parenchymatous goitre) or of a hyperplasia occurring on a colloid basis, since it is possible to produce experimentally a hyperplasia on a colloid gland basis in just the same way as one produces a hyperplasia on a normal gland basis.

To illustrate the above fact from goitre in man, where such cases have been more frequently observed, this is what occurs in those cases recorded in the literature as "Secondary Graves' disease" or Graves' disease engrafted on an old colloid goitre in contrast with the so-called "Primary Graves' disease," which is the same process occurring on the basis of a normal gland. Then too the long life of man and a more careful study of goitre in man has allowed Lawson Tait (Edinb. M. J., 1875, XX, 993) to observe the "stair-step" like progress of goitre associated with multiple pregnancies. This process interpreted by our present standards would mean a hyper-

plasia during the pregnancies with reversion to colloid gland during the intervals, with each succeeding reversion not returning to the size of the preceding reversion.

This relationship of hyperplasias to colloid glands and to normal glands may be best presented in the following diagram:



A, normal gland; *B*, all degrees of primary hyperplasia occurring on the basis of a normal gland; *C*-1, 2, the several degrees of hyperplasia returning to colloid state; *D*, colloid glands; *E*-1, 2, etc., the several degrees of secondary hyperplasia engrafted on the basis of a colloid gland; *F*-1, 2, etc., the secondary reversion of the secondary hyperplasias. Thus one might have tertiary hyperplasias and reversions, etc.

These data, *anatomical, chemical* and *biological,* we believe are sufficient to justify the conclusion that in dogs and sheep, at least, all pure colloid glands are reversions from degrees of active hyperplasia and are the nearest approach to the normal quiescent condition that glands can ever assume which have once undergone active hyperplasia. Further, this return to the colloid state is nature's evidence of a relief from some physiological deficiency. Lastly, the process of reversion being *physiological* rather than *pathological,* it seems to us to be more closely allied with the *involution type of atrophy* than with *degeneration.*

We are indebted to Profs. Stewart, Howard and Sollmann for their careful criticisms.

LESIONS OF THE NERVE CELL AND VASCULAR TISSUES PRODUCED BY ACUTE EXPERIMENTAL ALCOHOLIC POISONING.*

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The effect of ethyl alcohol, in its pure form, upon the organism differs in some ways from that of spirituous liquors of which it is the chief constituent, doubtless from the fact that certain ethers are present in the spirits and absent from the alcohol. The first result, after the ingestion of a moderate quantity of ethyl alcohol in man—a fluid ounce, for example, of absolute alcohol properly diluted—is to cause a fall in the heart's action of from fifteen to twenty beats a minute, accompanied by some hardening of the quality of the pulse. This is followed, almost immediately, by a feeling of muscular lassitude, then of mental confusion, both of which increase gradually, but are lost in an hour or two.

A few instances of its more continued effects may be cited. One man of forty years, who voluntarily subjected himself for a month to a course of ethyl alcohol, in daily doses, beginning with two ounces and gradually increasing to four ounces, taken mainly in the late evening, exhibited the following symptoms: After the initial vascular disturbance came considerable mental confusion, inability to control the voluntary muscles, and intense sleepiness. On the following morning, after a period of from six to seven hours' profound sleep, there was considerable irritability of the heart's action, which persisted up to three or four o'clock the following afternoon, mental lassitude, and difficulty in keeping up with the daily routine work. By the end of the month there were well-marked and persistent irritability of the heart's action, palpitation, at times a feeling of præcordial anxiety with some difficulty in respiration, a pulse showing a considerable increase in tension, and decided evidence of dilatation of the peripheral arteries—all indications of beginning fatty changes in the heart and muscularis of the blood-vessels. With these symptoms were others indicating considerable digestive disturbance in the form of mucous diarrhœas, neuralgic pains in the forehead and limbs, together with a lessened ability to think clearly at any time, and mental irritability. When the alcohol was stopped, all the symptoms, including the arterial dilatation receded rapidly, and soon disappeared.

A second individual, who drank 95 per cent. alcohol as a beverage in the place of whiskey, to the extent of a pint or more a day, at the end of three months exhibited profound mental changes in the form of pronounced loss of memory for recent events, delusions of persecution, and on the somatic side, profound cutaneous anesthesias with loss of knee-jerks and other deep reflexes, also indications of a fatty heart muscle and dilated arteries. Tremor, loss of tone of the musculature, difficulty in articulation, incoordination of the voluntary movements, as well as lancinating pains in the lower extremities were also noted. He recovered, almost completely, after a three months sojourn at a sanitarium.

In a third individual—a physician—who consumed a litre bottle of absolute alcohol a day for a period of three months, the changes were more profound. The heart's action grew weak, weaker and more irregular, complete anesthesia of the skin surfaces with entire loss of the deep and superficial reflexes supervened. With these came various visceral paræsthesias; then a rapid dementia began, which soon became profound, and shortly after the end of the period of three months he died from failure of the heart's action.

The ingestion of large quantities of ethyl alcohol is always followed by profound disorganization of the cardiac func-

* Abstract Paper.

tions, and a single dose of six or eight ounces, may be followed by rapid death, even in persons who are accustomed to the habitual use of spirits. In these instances there is a gradual lowering of the circulation, sub-normal temperature, bluing of the extremities, and a gradual slacking of the cardiac action until the exitus.

The minute pathological effects of acute alcoholic poisoning upon the human organism is practically unknown, nor is it possible to obtain material for microscopic examinations in sufficiently fresh condition from cases of delirium tremens that have died as a result of their debauches, as from the tissues of the lower animals that have been subjected to practically the same course of treatment. We have, therefore, availed ourselves of the material, furnished during the course of certain studies by Dr. Julius Friedenwald, upon the effects of alcohol on the tissues of rabbits. The alcohol was administered in slowly increasing doses until the animal had established a certain tolerance of the drug; it was then increased to a considerable amount, which was maintained until the animal died.

While the quantity given the animals was large, it can hardly be said to exceed the amount taken by many men while on a protracted debauch, and from which they eventually recover, perhaps after an attack of delirium tremens or other alcoholic psychosis, and fell considerably below that of the man, cited above, who took a litre a day.

Thus an individual weighing 150 pounds would take in the same proportion fifty times the quantity of alcohol as a three pound rabbit, and accordingly would attain a daily allowance of 750 cc. absolute alcohol, equal to about 1500 cc. of ordinary whiskey, with the difference that the ethyl alcohol is perhaps less deleterious to the tissues than the blended whiskeys of commerce.

Three rabbits were used in this study:

Rabbit A, weighing 1220 grams, received 5 cc. diluted alcohol on September 26, and the amount was gradually increased up to 15 cc. a day, which was maintained until October 21, the date of death. In all he received 190 cc. alcohol. After the exitus the body weighed 780 grams, and at the autopsy the principal microscopic lesion was a fatty degeneration of the heart muscle.

Rabbit B, weighed 1500 grams on September 30, and from that date received a daily allowance of from 5 to 15 cc. alcohol, and died on October 21, at which time he weighed 840 grams; in this case also the chief demonstrable lesion was a fatty heart. The total amount of alcohol consumed by this rabbit was 165 cc.

Rabbit C, weighed 1490 grams. The administration of the drug in the same quantities was begun on October 2, and death resulted on October 25, by which time the weight had been reduced to 920 grams. This animal died in convulsions after having received a total of 260 cc. alcohol. A fatty heart was again found.

One point of considerable interest to be noted in this experiment is that the resistance of the several animals to the poison is not proportionate to their weight, but to some inherent property in their tissues; thus, the heaviest one received only 165 cc., and the next heaviest, weighing 10 grams less received 260 cc. before death resulted. In all the nutrition of the rabbits was kept up as well as possible by giving them suitable and attractive food.

Histological Examination.

The tissues derived from the three rabbit brains were hardened in absolute alcohol and in Müller's fluid; while the staining for microscopic examination was done by the Nissl method, various nuclear dyes, and the silver phospho-molybdate procedure.

The results are separable into three divisions according to the various elements involved, which may be briefly given as:

Blood-vessels.—Damage positive.

Nerve Cells.—Damage positive, yet not so profound as in the cells of the blood channel walls.

Neuroglia.—Damage positive as to the lymphoidal elements, negative for the suport neuroglia.

We will consider in their order these various pathological changes.

The Blood-Vessels With Nuclear Stains.

Arteries and Intermediary Vessels.—The nuclei of the endothelial cells are everywhere swollen, in places are fragmented, and receive either too little or too much of the dye. The cellular protoplasm is also undergoing definite retrogressive alterations. The cells of the intermediary vessels look as if they had been subjected to severe strain (dilatation of the blood-vessel), as their even contours are distorted, and there are many irregular bulges in the walls.

The changes in the muscular layer are equally interesting. Nuclei are here and there absent over considerable areas of the middle wall of the vessel, and in those that remain certain abnormalities are apparent, the nucleus being badly stained, either wholly or in part. It is, however, in the substance of the muscular protoplasm that the lesions are most apparent, and show that the cells themselves are being subjected to a morbid process. They no longer have the substance clearly stained, but it is turbid, even hyaline in appearance. The protoplasm too is considerably swollen, and its receptive quality to the aniline dye is no longer good.

The Virchow-Robin lymph space is entirely obliterated by the swelling, and in those portions of the structure where the tumefaction is most pronounced, there is also an almost complete obliteration of the His lymph space, the outer lamina of the vessel being closely pressed against the limiting lining of the peripheral edge of the perivascular space.

Changes in the adventitia are not nearly so distinct as in the two inner coats, though in places it holds considerable numbers of leucocytes, or these may be packed between it—in considerable numbers—and the outer wall of the lymph space. These white blood corpuscles are necrotic and swollen.

The contents of the perivascular space—where the degree of compression is insufficient to obliterate them—is interest-

ing and instructive. In them are large numbers of leucocytes in all stages of disintegration, and besides, there are frequently a number of protoplastic bodies, several times the size of a polynuclear leucocyte, very granular, and without nucleus, that are, probably, formed from the remains of the partially disintegrated lymphoid corpuscles that have aggregated into crescentic or ovoid shapes. Besides these partly organized bodies, there is a quantity of detritus, finely granular in character, insufficient to cause, without the aid of the lymphoid cells, any blocking of the lymph currents. Osmic acid produces a slight blackening of the degenerating white corpuscles, as well as of the detritus within the lymph spaces, showing that fatty changes are present.

The capillaries, like the intermediary vessels, are twisted and tortuous, the nuclei show changes similar to those in the larger vessels, while the cell bodies have departures from the normal in staining qualities, and here and there in the lumen are plugs of white blood corpuscles, which, from their closely packed appearance must have entirely stopped the circulation of the blood in these vessels before death. The lumen, beyond these plugs, is entirely devoid of contents.

Veins.—Changes in the coats of these vessels are similar to those in the arterial system, but aggregations of dying polynuclear corpuscles are more frequent, and are by far the most striking feature both of their contents and surroundings.

These aggregations, which in the small vessels, may vary from three or four to more than a dozen, are located both within and without the lumen. Within the lumen are collections of white blood cells filling the interior, while numbers are seen penetrating the walls. So vast are the collections in the perivenous spaces that the whole cavity is, occasionally, tightly filled, and the back pressure, from the plugs as well as the compression of the vessel from the outside, has attained such a height that in a number of instances the walls of the vessels have ruptured, and red corpuscles are intermingled with the white ones, and completely fill the His space. In one instance the site of the rupture was located in the section.

All the leucocytes, both within and without the veins show, with aniline stains, more or less evidence of disintegration, in some instances extending to complete destruction of the cell.

Arteries.—The medium-sized and larger arteries show individual differences as to the extent that they are affected by the morbid process. This difference would appear to depend largely upon the numbers of lymphoidal plugs in the arterioles and capillaries, for where they are thickly scattered, there the degree of arterial degeneration is greatest, and particularly is this true for the muscular layer. It would accordingly appear that at some period antedating the death of the animal, aggregations of leucocytes formed in the smallest vessels, and a slowly increasing backward pressure began within the arteries, insufficient to occasion complete stasis, but enough to create unusual pressure upon them; accordingly, this pressure in combination with the poisonous effects of the alcohol carried with the current of nutritive plasma, caused degeneration of the cellular elements forming the vascular walls, the main stress of the active process falling, upon the inner coats of the arteries.

This severely increased blood pressure is, probably, only an exaggeration of what ordinarily follows the administration of a moderate dose of spirits. Following its ingestion comes a dilatation of all the arteries of the body from the paralyzing effect of the drug upon the vaso-constrictor nerve fibres, and this endures for a variable time according to the quantity of alcohol partaken of.

The mechanism of the cerebral arteries—in that they do not possess vaso-constrictor nerves, but are dependent upon the inherent contractility of the muscularis and other elements—allows of a greater influx of the alcohol poison into the brain than elsewhere. The vascular muscular cells, under the influence of the direct action of the poison, and free from extraneous nerve influences to urge them to return to a normal state, remain for a long time inert, the congestion of the cerebral tissues is long continued, larger amounts of poisoned blood pass through the brain, and incidentally a larger proportion of alcohol than to other ordinary tissues, such as the muscles. As a result the deteriorated serum, laden with the poison is transuded in increasing quantities through the capillary walls; it is carried to the lymph spaces surrounding the principal cerebral cells, their structures are bathed in the diluted alcohol, their activity is dulled by its narcotic action and inertia and torpor of the functional activities are the result, and finally, it is only after the entire elimination of the poison from the system that they resume their normal functions.

If the amount of the poison to which the tissues are subjected is very considerable, as well as continued from day to day, and the excretory functions become clogged for a long time, the damage to the vascular walls is proportionally greater. In the light of the present experimental cases, the damage may proceed to necrotic changes in the endothelial lining and muscular layer. Leucocytes, formed in other portions of the body, mass in the cerebral vessels, from the increased quantity of blood brought by the arteries not being promptly carried off by the venous channels, and accordingly, we find a constant accumulation of the white corpuscular elements. This terminates, finally, in blocking of the capillaries as well as of the smaller veins, diapedesis, choking of the perivascular lymphatic channels, and eventual damage, both to the wall of the arteries by back pressure on a tissue already prone to undergo degenerative changes from the deleterious effects of a poisonous drug, and to the veins from abundant extravasations and transudations of the white corpuscular elements.

Nerve Elements.

Changes in the nerve cells, while definite to a certain degree, are by no means so intense as in the mesoblastic vascular structures. With aniline dyes positive degenerative changes are best determined in the neighborhood of the more extensively embolized vessels. Here the nerve cell bodies do not show the normal Nissl staining, but appear uniformly and

finely granular, also they do not take up nearly so much of the dye as cells that are located in areas in which damage to the blood-vessels is less severe. In the degenerated cells alterations in the nucleus and nucleolus are beginning, principally noticeable in the swollen and spongy state of the nucleolus, but the damage is not nearly so extensive or positive as in chronic alcoholism.

The silver-molybdate method shows more extensive changes than the Nissl, but these are confined entirely to the cell branches, which are invisible in preparations by the latter method. The departures from the normal in the dendritic extensions do not appear everywhere throughout the section, but like those noticeable in the aniline preparations are most definite where vascular damage is greatest.

The departure from the normal in the dendrites is shown by extensive and irregular swellings in the course of the branches extending over considerable distances in their long diameter, which suddenly decrease to the normal caliber of the stem. The majority of the lateral buds, or gemmulæ, are lost over the areas of tumefaction, though here and there damaged ones may be found projecting from the sides of the enlargment. Even the dendritic stems that have no swellings have a considerable diminution of the number of the lateral buds, and those that remain have lost a part of their natural characteristics, the rounded knob of the pear-shaped bud being lost, while the part that remains is seen as a short even projection from the sides of the protoplasmic stem. Often, also, those remaining have a greater thickness than is customary, from the insertion to the termination. Accordingly, it would appear that the remaining parts of the lateral buds were swollen. In places where the destructive process has been greatest, the gemmulæ are entirely stripped off from the parent branch.

So far as could be determined the axis-cylinder and its collaterals are not implicated in the destructive process.

Neuroglia.

With the aniline stains there is no increase of fixed nuclei among the tissues nor would this be expected in a semi-acute process. With the silver stain the supporting elements present no variations from the control. On the other hand the vascular neuroglia—belonging as it does to the lymph excretory system of the brain—gives distinct evidence that the stress of excreting a vastly increased amount of detritus from the rapid tissue changes present, as well as from working at a disadvantage under the narcotic influence of the alcohol contained in the nutrient serum, has been too much for its capacity. The cell bodies are larger, the protoplasmic extensions are thicker and more knotty, and the channeled arms extending to the perivascular spaces of neighboring blood-vessels are more prominent than in control preparations.

Conclusions.

1. In acute alcoholic poisoning, the stress of the action of the drug falls upon the tissues of the walls of the blood-vessels, rather than upon the nervous elements of the brain.

2. The involvement of the nerve elements is more gradual than that of the mesoblastic tissues, and only becomes noticeable, by present methods of staining and examination, after the lymphatic channels are choked with the detritus of white blood corpuscles and other cellular elements.

3. Nevertheless, the deteriorative action of ethyl alcohol on the nerve cell is apparent, and when prolonged, in more moderate doses than was administered to the rabbits, produces well defined cellular changes, as is evidenced by nuclear and dendritic changes.

4. In its action on the nervous tissues, ethyl alcohol may be likened to certain other poisons, such as ricin or the toxalbumins. The administration of these toxins causes the same departures from the normal in the nerve elements, but the alcohol has a much greater destructive effect upon the white blood cells, as well as the cells composing the walls of the blood-vessels.

5. The effect of the drug is proportionate to the quantity administered to the animal, as well as to the duration of its poisonous action before death ensues. Limited quantities continued over a considerable time accomplish, in modified form, the same destructive results as higher doses, acting during a few days.

THE ACQUIRED VENEREAL INFECTIONS IN CHILDREN.[1]

A Report of One Hundred and Eighty-Seven Children Treated in the Women's Venereal Department of the Johns Hopkins Hospital Dispensary.

"A STUDY."

By Flora Pollack, M. D.,
Assistant in the Department of Gynecology, Out-Patient Department, Johns Hopkins Hospital.

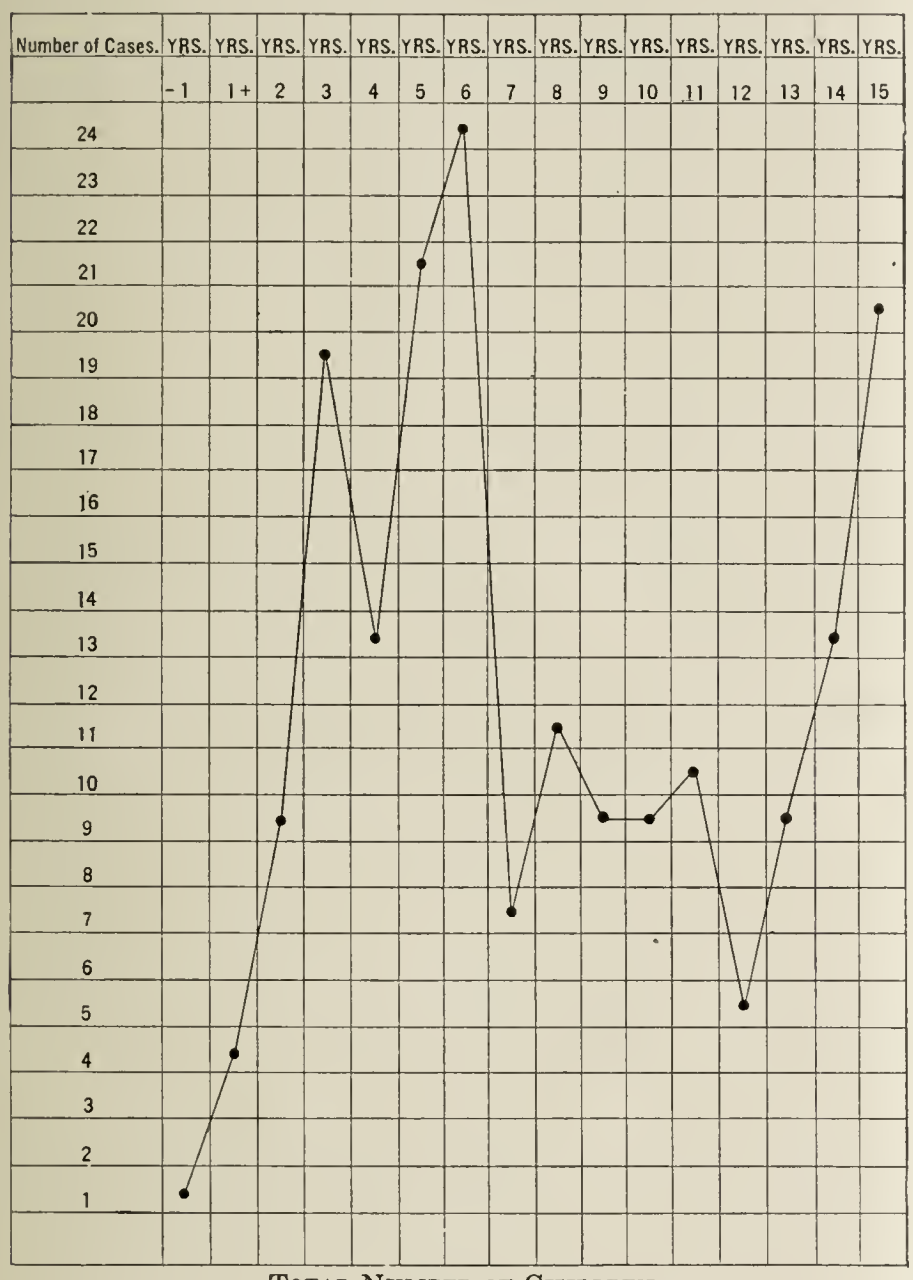
I

In a former report of the work of this department, I called attention to the unusually large number of young children brought here for the treatment of acquired venereal infections. This paper is a continued study of this phase of the subject with especial reference to its social, rather than its medical pathology, though for those interested in the medical side of it, I shall append the medical histories in brief of the cases, *ad seriatim;* referring to special cases only as they bear on certain points I wish to emphasize.

As I said before, and repeat with firmer conviction than

[1] Maryland Medical Journal, August, 1906. See also article by Dr. Abraham Wolbarst, J. Am. M. Ass., September 28, 1901.

ever, the cause of most of the outrages upon children is to be found in the superstition that a person infected with either syphilis or gonorrhœa may get rid of it by infecting another, and preferably "an untouched virgin." Thus a defenceless child is the most natural victim. This superstition is so deeply rooted in the belief of men that were you to ask ten police officers, cab drivers, hucksters, etc. of the truth of it I think eight would affirm it as a "*fact*," and all would know of its existence. Its basis, as I said in the former report, lies in the fact, that the syphilitic infected parents have no children



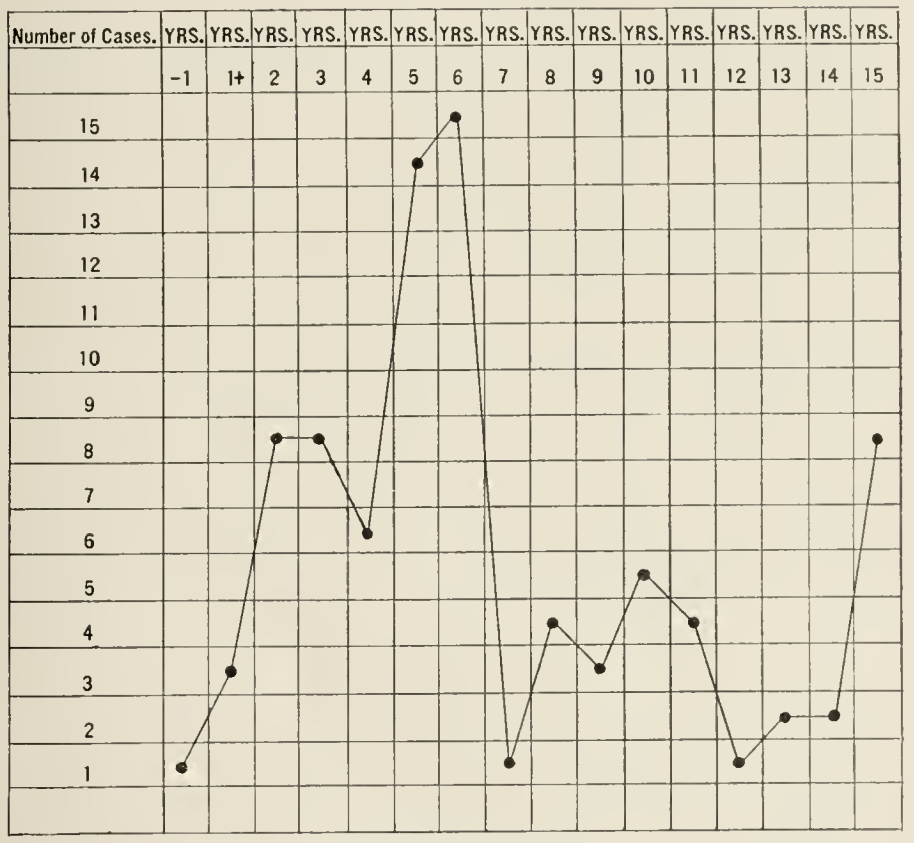
TOTAL NUMBER OF CHILDREN.

(except miscarriages and premature children, which in their ignorance they do not attribute to their disease), and when they do have a child, though it be diseased, they believe themselves to be healthy; they argue, that the child has taken the disease away from them, and therefore they are better, instead of recognizing the true explanation, that because they are better they have a child, "even though the child bears witness to their disease."

Time and again a woman has requested me to prepare her for maternity with the avowed intention of having, "the baby take the disease away from me"; again women, wise in this lore, tell other waiting women, that "they intend then to get rid of their disease," and the men patients admit that "they have gotten rid of their disease on a *baby*."

It is held by some that this abuse of infants and older children may be due to the form of perverted sexual instinct, known as Sadism, but the appalling number of these cases in this city (indeed in all more densely populated centers), about eight hundred to a thousand in a year, seems too large to credit to perverts; whereas the large number of physically diseased persons who wishing to rid themselves of their disease by infecting another, makes the "infectionist" theory, as I shall hereafter term it, more tenable.

In the charts which I have made of the ages of the infected children, it will be seen that far the greater number are six years and under, and of these the white children outnumber the colored, whereas after six, and when the sexual element begins to assert itself, the colored outnumber the white. There are fifty-four white children of six years and under, as compared with thirty-three colored, and sixty-three colored over six years of age, as compared with thirty-three white children over six years. On the other hand there is only one negro child between one and two years against one under a



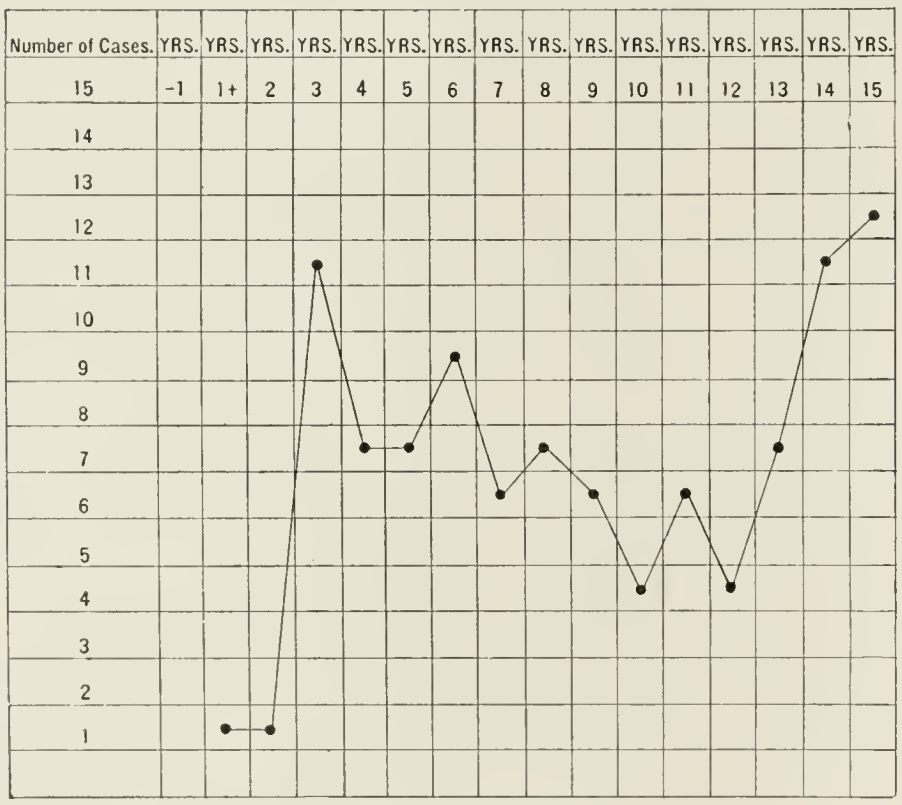
WHITE CHILDREN.

year, a ten-weeks-old white child (case No. 28, card No. 13,344), with hymen ruptured, a bubo, an ecchymotic spot on one labium, and a gonorrhœal vaginitis; one colored child at two years, three white children between one and two years, and eight at two, whereas the colored reach the maximum at three years with eleven cases, with only eight white cases at the same age, six at four, fourteen at five and fifteen at six years (see charts).

In studying the total number of both blacks and whites, we find the pitiful fact that there are almost as many children, nineteen in fact, of three years, as of fifteen years where there are twenty, or of five and six years where we find twenty-one and twenty respectively. These charts tell more eloquently

than words, the part the child plays in this tragedy since they were compiled to meet the charge so frequently made "that the children are vicious," a charge as cruel as it is stupid, since children at these early ages are not sexually vicious, that urges me on to the defence of babyhood, and girlhood in our city. It is not a fancied danger, nor an exaggerated condition that faces us, it is not only the child of the slums and of ignorant parents who is the victim, but every girl baby in the city (yes, even a boy) is in danger of infection, and the laity should know it and be warned. In my records I find the histories of two children, one of three and the other of three-and-a-half years, who had been abused; they are the children of well-to-do people, living in the best part of the city, and the records of other physicians record similar sad stories.

It is the hope of arousing intelligent interest in such a



Colored Children.

state of affairs that this study is undertaken. The School Board of this city, at the instance of the committee on "Social Pathology of the Prisoners' Aid Association," has already agreed at its meeting of March 11, 1908, to exclude school children, reported to the chief truant officer, upon a reputable physician's certificate stating that the child ought not to attend school on account of an infectious disease, but not the nature of the disease; this step was taken because the Board of Health cannot, in the present state of public opinion, require the notification of these contagious diseases. If this is not done, infected children mingle with the uninfected, and thereby innocently endanger them; this is particularly true of syphilis, but it is a hardship to the child with gonorrhœa in that it goes to school when it should rest and be under treatment; that at least has been my experience.

The Juvenile Court also recently became interested and offered its co-operation, the presiding judge suggesting "that the court be notified of each case, and a probation officer be appointed to visit the child to discover, if possible, the guilty individual." The spontaneous sympathy and co-operation of these two bodies are a great encouragement in this work.

The police and detective departments of the city also have been helpful allies in the protection of these children.

The Juvenile Court has had three cases under its care and the Criminal Court will shortly determine the fate of a man accused by a fourth child, but in the vast majority of cases no clue to the perpetrator of the crime is ever obtained, often because of the youth of the little patient; at times through the unwillingness of the family to betray one of its members; and again, and perhaps oftenest, because the child has been attacked by a stranger or is too intimidated to tell what she knows; servants in the house not only endanger, but actually infect a child or children as witness the recent case of a six-year-old boy *viciously* infected by a nurse girl who was sentenced to seven years in the penitentiary. These infections are never accidental or innocent and this is the important point I wish to bring out in this paper.

It is usually easy to diagnose the case of an outraged child; such a child shows evidence of a ruptured hymen. However, it should be remembered that the child's hymen does not form when torn carunculæ myrtiformes, but simply serrations on its free border; it does not bleed freely because of its extreme delicacy of structure, resembling in this respect the lingual frenum, which as is well known is often cut and then torn for tongue-tie without loss of blood, or with only a few drops of a faintly blood-tinged serum. This is important in medico-legal cases, and it should be remembered also that in those children in whom the act has taken place more than once, the *hymen disappears entirely leaving the vagina an open canal continuous with the perineum,* without any evidences of carunculæ and NOT prolapsed as is a parturient canal after laceration. The ruptured child's hymen is characteristic and once seen is never forgotten.

In referring these cases to the acts of an infectionist rather than to those of a sadist, certain important differences are to be noted. The act of the infectionist is premeditated, is the result of a logical reasoning, and has no sensual, cruel impulse as its motive, but is always due to the belief that by infecting another, he purifies himself, whereas the sadist is a moral pervert, and seeks to gratify his sexual impulses, which are non-excitable in a normal manner, by a sensual gratification which is obtained through smell or sight or touch, and often without violence to the sexual organs of the victim. The infectionist wants primarily to get rid of his infection, and sexual gratification is not his guiding impulse. In proof of this is the fact that most of the children are infected with very little injury to the genital canal. I recall one case where a colored baby of two and a half years was brought to the dispensary by its mother almost immediately after the assault with no visible injury to the hymen or any other part of the genitalia,[2] and yet two days later the child developed a typical

[2] I had absolute proof that an assault had been committed!

gonorrhœa. As compared with this, is the case of a child of three who was cruelly torn by "the man's finger" as she insisted. She bled freely and the bloody hymen and vagina healed in five days without the development of gonorrhœa. This outrage was evidently committed by a sadist. The case is instructive from a medico-legal point of view, in that, with the marked laceration of the parts, the hymen healed with only the above-mentioned serrations, and with the left labium minus torn from its union at the posterior commissure as evidence of the attack. This injury to the labium resembles a peculiar congenital condition, and therefore may be misinterpreted by one unfamiliar with the facts of the case.

The infectionist wants "an untouched virgin," and therefore attacks children by preference, and the assault is always genital, and at times rectal also, as in a recent case, where a child of seven accused a man of two assaults, an accusation which seemed confirmed by the injury to the vagina as well as to the rectum; she has a gonorrhœa.

The sadist seeks an abnormal sexual gratification as described above, and attacks young and old, male and female, at times without regard to the sex of his victim, simply from a morbid impulse to gratify his appetite.

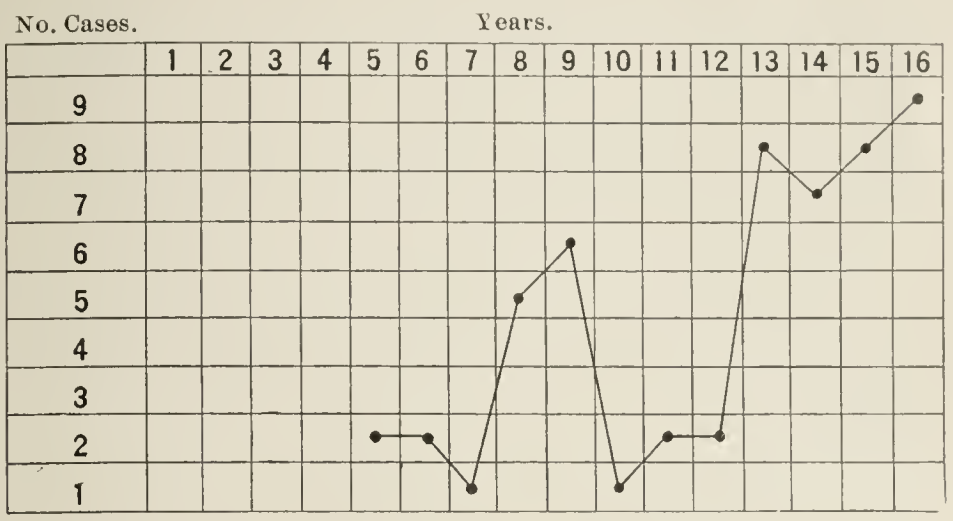
Many of the children admit that they have not struggled or cried out during the assault and the mothers assert that there was no blood on the child's clothes. The mother's first knowledge of the crime is derived from the the first purulent discharge she sees on the garments, when in many instances it is too late to discover the offender. These facts are opposed to the theory that the assaults are of a sadistic nature since all the evidence points to a normal sexual act.

I go into this detail because of the great difficulty in obtaining punishment for this crime. If it is a sadistic attack, and the offender a pervert, the law treats him as morally irresponsible. If the above theory of "infectionism" is correct, and I think closer study by others will prove it to be so, we may hope to get laws which will protect not only the child's honor, but also her health. As yet the laws to protect the honor of a female child are very lax.

In order to determine about how many of these cases occur in this city in a year, I visited the various station houses, and through the courtesy of the marshal had access to the records for a year, hoping to ascertain the number of cases of rape and indecent or felonious assault which came to the notice of the police. I took cases under sixteen years of age only, and although there were many, the very young children were not represented to the same extent as were the older, for the reason as I said before, that they are very often too young to tell or are too intimidated to do so (see chart below).

There were but sixty-one cases brought to the eight station houses in an entire year. Of fifty-two whose ages are given, the ages were as follows:

5 years.....	2 cases.	11 years.....	2 cases.
6 "	2 "	12 "	2 "
7 "	1 "	13 "	8 "
8 "	5 "	14 "	7 "
9 "	6 "	15 "	8 "
10 "	1 "	16 "	9 "



My own estimate of 800 to 1000 cases in a year in the entire city is based on the work done during the past six years in the Johns Hopkins Dispensary, where we see an annual average of about 30 cases. There are twenty other hospitals and dispensaries of which ten are teaching institutions in the city where such cases may be treated. In my estimates I use only the ten teaching hospitals, as I do not want to exaggerate the facts, preferring rather to underestimate them. If ten institutions treat each thirty cases in a year, they will treat altogether 300 children, and in Dr. Hooker's report 224 physicians reported 103 children treated for these infections in private practice in one year. If, therefore, 224 physicians treated 103 children in their private practice 1200 physicians would have treated about 550. Adding these to the dispensary and hospital total we get nearly 850 cases, an appalling number of infections of the most defenceless portion of the population. These estimates are low, and are so intentionally, lest exaggeration may be charged; unfortunately it is the real state of affairs, and it behooves us, medical men as well as laymen to arouse ourselves to the dangers of our little ones, and to build a protecting wall around our defenceless children.

II

Analysis of Cases.

The acquired venereal diseases in children differ in no essential from those of the adult, save in two of the complications, *i. e.*, abscess of Bartholin's glands and pelvic abscess, the latter not occurring at all, the former rarely; and this is probably due to the undeveloped state of these organs in the child. Although pelvic peritonitis is rather common, it is of a low degree, and in this series of 189 cases has never reached the suppurative stage. The symptoms of peritonitis in a child, who has a gonorrhœal vaginitis or urethritis, are fever, abdominal tenderness usually with retraction, at times distention, vomiting and constipation. In nineteen cases or 10 per cent of this series, none of the children developed abscess. Although the child looks ill, it does not lie down, but throws itself over a chair lying on its abdomen, until the paroxysm is over (for the pain is paroxysmal), and then resumes its play; the child loses weight, is pale and fretful, but cannot be induced to remain quiet, proving that its condition is not as grave as in the adult. What the end result in these cases is, I have not yet been able to determine, *i. e.*, whether

or not the peritonitis interferes with the future development of the ovaries.

Bartholin's abscess occurred but three times or in 1.6 per cent; in cases No. 135, aged 14 (card No. 7750), No. 160 (card No. 88,386), aged 15, and No. 178, aged 9 (card No. 6236), the youngest in our series, who also had mastitis. Buboes on the other hand are rather frequent, twenty-eight or not quite 15 per cent developing large tender glands, though even here suppuration is rare, occurring but twice in the series.

Ophthalmia is as uncommon in the child as in the adult, occurring in case 77, aged 6, white (card No. 43,264), and in case 183, aged 8, colored (card No. 436), or two cases in 187. This is no doubt due to the lachrymal secretion of the adult eye, in contradistinction to its absence in the new born, as was pointed out in the report of this department's work two years ago.[3]

Arthritis is rare, occurring but three times, in case 18, aged 6 (card No. 8302), in case No. 105, aged 5 (card No. 70,672), who had peritonitis also, and case 149, aged 2½ (card No. 2982). One child, case 37, in this series, aged 10 (card No. 4660), had chorea, which cleared up under Fowler's solution; whether it was a complication of gonorrhœa or was independent of it, is difficult to say.

Involvement of the rectum is rather more frequent and occurs as a proctitis as well as an ischio-rectal abscess and occurred 7 times, about 4 per cent. Case 60, aged 1½ (card No. 25,589), had vaginitis with prolapse of the rectum. Case 75, colored, aged 7 (card No. 43,533), who had gonorrhœal vaginitis, with anal infection, had also lues. Case No. 82, white, aged 6 (card No. 45,254), had a bubo, vomiting, and recto-anal infection complicating the vaginitis. Case No. 87, white, aged 6 (card No. 39,535), had straining at stool, but as only one visit was paid to the dispensary, this may have been due simply to constipation. Case 88, colored, aged 3 (card No. 38,059), had rectal involvement. Case 146, white, aged 8 (card No. 2761), had enlarged inguinal glands and a proctitis. Case 159, colored, aged 11 (card No. 88,224), had a bubo, an ischio-rectal abscess and lues.

Seven cases had rectal complication though many children suffer from constipation and therefore many have blood in the stools; the cases referred to had definite gonorrhœal infections of the rectum.

Urethritis is the most frequent complication as would be expected occurring at all ages; thirty-six cases in all, or 18 per cent.

The double infection of syphilis, either as primary sores or as secondary lesions, and gonorrhœa occurred rather often. Taking the cases first that had primary sores there were 7, as follows:

Case No. 24 (card No. 10,914), colored, aged 13, primary sore with gonorrhœa.
Case No. 47 (card No. 16,029), colored, aged 5, primary sore with gonorrhœa.
Case No. 48 (card No. 14,756), white, aged 15, primary sore with gonorrhœa.
Case No. 114 (card No. 64,213), colored, aged 14, primary sore with gonorrhœa.
Case No. 119 (card No. 53,953), colored, aged 11, primary sore, then secondaries.
Case No. 172 (card No. 12,187), white, aged 9, primary sore with gonorrhœa.
Case No. 187 (card No. ——), white, aged 7, primary sore with gonorrhœa.

Of acquired secondary syphilis, but without absolute knowledge of the primary sore on the part of the physician, there were 29 cases—all colored children, varying in age from 3 to 15 years; 9 between the ages of 3 and 11.

Pregnancy complicated five cases, as follows:

Case No. 30, colored, aged 14 (card No. 558), lues also.
Case No. 45, white, aged 15 (card No. 16,405).
Case No. 64, colored, aged 13 (card No. 49,794), also luetic.
Case No. 135, colored, aged 14 (card No. 7750), Bartholin's abscess.
Case No. 140, colored, aged 15 (card No. 9839), lues.

It is interesting to note that all of the pregnant children had complications, either lues or Bartholin's abscess, and all had gonorrhœa. Bleeding occurred frequently, but it was of no importance except for the mothers' fears. It occurred sixteen times, twice preceding the gonorrhœal discharge, when it was doubtless due to the assault, and fourteen times during the gonorrhœal attack when it may be justly regarded as a complication, beginning from five to fifteen days after the onset of the disease, and continuing from a few days to two weeks; it is not very free as a rule, but enough to stain the garments or to show in the vessel after urinating. It is not always possible to locate the source, in case No. 185, E. G., aged 5 (card No. 28147), it came from the excessively hypertrophied carunculæ myrtiformes which covered the entire surface of the hymen like a mass of granulation tissue. Of the cases that bled eleven were white, and only four colored; their ages ranged from two to ten.

One child had rhinitis; one a scarlatiniform rash over the entire trunk; one a cardiac lesion and peritonitis; one chorea; and one mastitis.

The extensive and very painful excoriations due to the gonorrhœal discharge must be regarded as one of the symptoms rather than a complication of the disease, as they are always present, even though proper treatment soon relieves the condition and if continued prevents its recurrence; it is a curious fact that in exacerbations of the disease redness is apt to occur with the discharge, when this is gleety, as well as when purulent.

The question of the contagiousness of the diseases is of the utmost importance, since the danger of other members of the family notably the children contracting it is very great. Syphilographers know that syphilis may be innocently contracted, but they are agreed also that gonorrhœa is almost always a venereal disease. The institutional epidemic gonorrhœal vaginitis may be pointed out as one of the rare exceptions. Let it be granted that these are not venereal in the true

[3] Maryland Medical Journal, August, 1906.

sense; but we must remember the eurious faet, that all infeetious diseases seem to gain in virulence in children's institutions, the mildest child's disease, "varieella" in the household, beeoming a dreaded scourge in an institution; it may be therefore justly regarded, that these outbreaks in ehildren's hospitals and asylums, are not in the same eategory with the subjeet under diseussion, yet I would be skeptical even here, as the attendants are not all trained, educated people, and may aecidently or even intentionally carry the infeetion from ehild to ehild.

From this standpoint I have collected the family infections, and find that in 189 cases five families with eleven persons were infected; there were three families with two ehildren, and one family with three children as follows:

Case 97, G. R. (card No. 33127), aged 3, colored.
" 98, H. R. (" " 33124), " 7, "
" 148, M. D. (" " 2900), " 5, white.
" 149, R. D. (" " 2982), " 2½, "
" 151, M. L. (" " 3497), " 3, "
" 152, A. L. (" " 3498), " 6, } twin sisters.
" 189, C. L. (" " 65314), " 6, }
" 162, R. G. (" " 89801), " 5, white.
" 163, J. G. (" " 90021), " 2, "

In none of these cases could the source of infection be traced; in the family of three, the first case occurred early in the spring of 1906, and the two other children, one of the twins and the baby did not become infected until the following autumn, about six months later, and after the original one had been apparently well for months.

In one case in which an assault was attempted on two little sisters, the elder one awoke in time to escape the assault, and escaped infection, while the other little one less fortunate fell a victim to both assault and infection.

It must be remembered that at least two factors are requisite to infection, first an injury to the mueous membrane, and seeondly a fresh living virus. If the mucous membrane remains intaet, even the presence of virulent organisms will fail to produce infeetion, and on the other hand, an inert virus in an injured mucosa is non-infectious. The possibilities of towel, bathtub or toilet infections of gonorrhœa are extremely rare, but they offer a very useful shield for a guilty individual, and they also impede justice, and make it extremely difficult to protect children from these assaults. Let it be known onee and for all that gonorrhœa is thus aequired only most exeeptionally; and this possibility when offered in court as a defenee should only be aecepted after the most exhaustive examination of all the attending eircumstances in the case. Gonorrhœa thus acquired probably occurs in much less than 1 per eent of all the cases.

Temperature.

The temperature in gonorrhœa without complieations is not much above the normal, but any complieation raises it eonsiderably, though not for very long periods. The child with the cardiac complications is said to have had a temperature of 104° F., before admission, but on the day of admission it was 100° F., and never went above 102° F. A child who developed an ophthalmia had a temperature of 103° F. for a day only; another who had both a primary sore and gonorrhœa, developed a temperature of 103° F. when the secondary stage was ushered in seven weeks after her first visit to the dispensary; the child was very ill for several days but soon recovered her usual health and spirits, to have recurrences of her fever when treatment for the luetic infection was neglected. This case impresses upon me the necessity of the control of infected children, because it is now impossible to compel the parents to have the child properly treated or to keep her out of school during the infectious periods of the disease. This child was sent to school regardless of instructions to the contrary, and not only that, she was not brought back for treatment though the parents were urged and warned to do so.

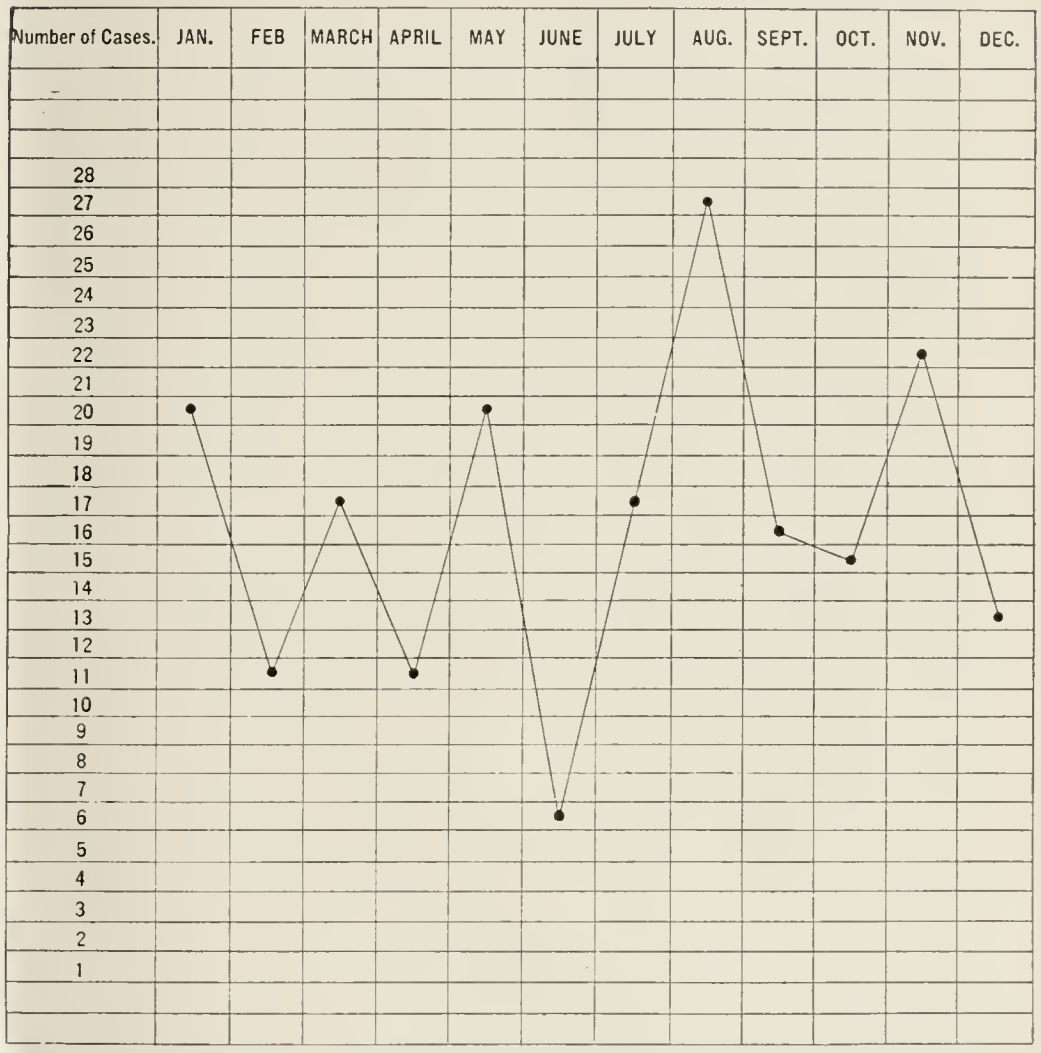


Chart Showing Seasons of Infections.

It is true our School Board, through its action of March 1, 1907, will co-operate with a physician to keep an infected child out of a school, but we *cannot compel the child* to *stay out,* if the *parents insist upon attendance at school*; therefore syphilis at any rate should be a notifiable disease for school children, and parents or guardians should be compelled to keep the children under medical care to insure the other children against infection when the child is returned to school.

Sanger, in his "History of Prostitution," calls attention to the influence of the heated season of the year as one of the factors in the crime of rape. To determine this point I have charted 196 cases and find that in the six cold months, January, February, March, October, November, and December, we have exactly the same number of cases as in April, May, June, July, August and September, 98 in both epochs. It is true

that in August there were 27 cases, the highest number of all, but it is equally true that in June we have the fewest number, only six, whereas January and May keep pace with each other, as do March and July; so that the cases which constitute the subject of study in this paper do not come under the heading of rape, but of infection, as a result of an individual trying to cure himself by becoming an infectionist.

It may be urged that it is not fair to draw conclusions from only 196 cases, but Kraft-Ebing calls attention to the increasing number of attacks on children in Europe and cites as one cause, this very superstition. The belief that sick people take the strength from the well, should they sleep together, is a very popular one to-day, among all classes of people; and the hope that the aged may gain vitality from the young is exemplified in the case of King David.[4]

Treatment.

Treatment as practiced in the adult seems to me of doubtful advantage; we cannot prevent complications, and we do not shorten the duration of the disease. All we can hope to do is to mitigate its severity. Some children come to the clinic but once; and we see recurrences as long as 18 months after the first manifestations.

One child, case No. 98, colored, aged 7 (card No. 33123), came with fresh signs every year in January, for three successive years, but I think this must certainly have been from repeated exposures, and not due to exacerbations of the original attack, such as occur in the cases above referred to, consequently treatment directed to the *cure* of *gonorrhœa* seems to me an almost hopeless undertaking, but treatment for the painful complications, such as the excoriations of the vulva and thighs, constipation, abscess and the like is very helpful. We usually treat the gonorrhœa with a 2 per cent protargol solution poured over the vestibule with a small glass syringe, and the reddened areas with zinc oxid ointment or a bismuth paste, one dram to the ounce; as a coating to the skin, to protect it from the discharge, and then to relieve the little sufferer, this is of great value. For the rectal condition, no local treatment is attempted unless there be an ischio-rectal abscess, which is incised and drained; the bowels are to be kept open, especially if peritonitis develops, and the child should be kept in bed, but this is almost impossible. Some writers speak of the extreme gravity of peritonitis in the child, but that has not been our experience. The case reported by Hunner and Harris in the Johns Hopkins Hospital Bulletin for June, 1902, and which ended fatally, was a patient in this department, but belongs to an earlier series of cases than those I report, and is the only grave case I have ever seen, and I think must be regarded as an exception. The vomiting of the little patients is easily controlled by small doses of calomel, 1/10 grain every half an hour, repeated five or six times, and very often a bland diet is all that is required with hot spice bags[5] to relieve the pain.

[4] I Kings, Chapter 1. Death of King David.

[5] They consist of various finely powdered spices in a flannel bag, heated in whisky, their advantage being that they are light in weight and unirritating to the skin.

Bubos as a rule recede without breaking down, and although they may be so painful that the child limps, they seldom require treatment.

The arthritis in the few cases I have seen required no special treatment; either my cases so far have been exceptionally mild or grave inflammatory changes are uncommon in children. It is certain that so far none of the cases have required special treatment.

The syphilitic children receive the usual house specific, *i. e.*, bichloride of mercury and iodid of potash in solution graduated to their ages. They respond well as a rule, so well indeed that it is impossible to keep them under supervision in the absence of any legal control of this contagious disease.

The urethritis was not treated in any case, as the urethra is very small and the unfortunate children are so afraid of the pain, that no special local treatment is attempted, and only in some rare instances is the Lafayette mixture prescribed.

The only case of cystitis was irrigated with 1 to 5000 nitrate of silver solution and recovered after several exacerbations.

The other complications were treated as the case required, *e. g.*, one case of gonorrhœal vegetations was relieved, after the gonorrhœal discharge had ceased, by the actual cautery (Paquelin) under ether anæsthesia.

Summary.

The acquired venereal infections in children are far more common than the medical profession or the laity realize, and the increasing frequency of the infection of baby girls by criminal infection makes it a matter of the gravest concern to the social worker, the sanitarian and the legal protectors of the community.

Clinically the venereal infections in children run a milder course as regards grave complications, than is the rule in the adult, but the number of complications, and the duration of the disease seem almost identical.

The complications observed in the order of their frequency were:

Urethritis	36 cases.
Bubo	28 "
Secondary syphilis	29 "
Peritonitis	19 "
Bleeding	16[6] "
Primary sores	7 "
Proctitis	7 "
Pregnancy	6 "
Bartholinitis	3 "
Arthritis	3 "
Ophthalmia	3 "
Rhinitis	1[7] case.
Dermatitis	1[8] "
Chorea	1 "
Mastitis	1 "
Cystitis	1 "
Endocarditis	1 "
Gonorrhœal vegetation	1[9] "
Soft sore	1 "

[6] Two before the development of gonorrhœa, fourteen after.

[7] The nasal discharge containing typical organisms.

[8] Scarlet rash.

[9] Case of venereal warts (probably gonorrhœal).

The duration of the disease as in the adult is variable, and cannot be prognosticated either by the intensity of the attack or the severity of the complications.

Sixty-seven or over 30 per cent made but one visit, the average of visits made was $3\frac{1}{6}$, covering a period from three weeks to three years.

Treatment seems not to influence the course of the disease, the various methods tried to determine the relative merit of each were: Douching with potassium permanganate 1 to 5000, bichloride of mercury 1 to 8000, compound menthol powder used in the dispensary, silver nitrate solution 5 per cent strength applied directly to the vagina through a urethral speculum, and protargol 2 per cent in water or in glycerin poured over the vestibule only.

The treatment was given in the dispensary and supplemented at home by the mother; later we treated the child at the dispensary only, having the child come daily, or on alternate days, and finally at longer intervals, this too being supplemented by home treatment, but the results remained identical. As the little patients have been hurt before they come to us, they dread any attempt at treatment; and as all treatment directed to the vagina is painful, and cruel, since without beneficial results, I have for some time past used protargol simply poured over the vestibule, and the child soon learns that she is not to be hurt, and submits quietly, whereas under the former methods it required three people to hold and treat a six-year-old child, and the mothers had similar or more difficulty at home.

In protracted cases the child grows pale and thin, and for these the syrup of the iodid of iron or the elixir of iron, quinine and strychnine are beneficial.

The etiology of these cases is usually very evident. The hymen is either nicked in several places, presenting a characteristic serrated free border or it has one tear extending from the margin down to its vaginal attachment, usually somewhat to one or the other side, not directly in the median line. In medico-legal cases great stress is laid upon the fact that the mother did not see blood on the child's clothes. In the cases in which the hymen is not torn through, we can readily see why there was not much blood lost, not enough to stain the garments. The membrane is very thin and at its free border seems to be no more than the delicate mucosa, and tears without loss of blood just as the frænum of the tongue can be severed without loss of much blood.

In the secretion as it pours out of the vagina or urethra typical gonococci can readily be demonstrated, but not in that which covers the pudendum which does not stain at all or only feebly.

Prophylaxis seems to me the most important remedy for this condition. We must recognize the superstitions or perversions, call them what we may, and try to correct them by all the means in our power.

In Baltimore the various charitable organizations recognize the existing condition, and give lectures to spread the knowledge. The School Board co-operates with the medical profession to protect uninfected children by agreeing to allow an infected child to remain at home, simply on the strength of a reputable physician's certificate stating that the child should be kept at home. The Juvenile Court volunteered to co-operate with this department in bringing to justice the criminal or in protecting the child brought to its attention. The Police Department, and most important perhaps of all the State's Attorney's Office lends it aid in the prosecution of the "infectionists."

The Playground Association also takes much real interest in all conditions affecting the moral welfare of children, and to this end plans a course of instruction for the teachers and playground directors on this social evil. Many of the teachers in the public schools feel keenly the need of wider recognition of this crime on the part of the authorities, the parents and the public generally.

The Charity Organization Society of this city has inaugurated courses of lectures in colored church societies and meetings to teach the public the prevention and cure of tuberculosis as well as of this "the hidden plague"; it has been my privilege to address several of these meetings, and it is encouraging to feel that the knowledge and advice have not always fallen upon hostile or barren ground.

Of all the forces which have aided in encouraging me in this work none have done more in a practical way than the Prisoners' Aid Association of this city, for through it, the matter was brought to the attention of the School Board, and this Association stands to-day as the first organized non-medical body to recognize the gravity and importance of this condition, not only as it affects the school children, but all children and the criminal as well.

It may appear that the medical section of this study has not received the consideration it demands, but as curative treatment is so unsatisfactory we must direct our efforts to the prevention of the evil and that is indeed the object of this paper.

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F. Pollack, in Maryland Medical Journal, August, 1906. Calls attention to the prevalence of the superstition regarding the cure of gonorrhœa by transferring it to virgins.

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Hunner and Harris: Acute General Peritonitis (Gonorrhœal), Johns Hopkins Hospital Bulletin, June, 1902.

CLEMENS von PIRQUET, Ph. B., M. D.

It gives us pleasure to announce that Dr. Clemens von Pirquet has been appointed Professor of Pediatrics in the Johns Hopkins University, and Physician-in-Chief to the Harriet Lane Home for Children, February, 1909. The hospital is to be erected on the grounds of the Johns Hopkins Hospital, and to be conducted in affiliation with the latter hospital.

It is expected that Dr. von Pirquet will assume the duties of the new chair in the autumn of 1909, and that the new hospital will be completed and in operation in the early part of 1910.

A few of the important dates in his life and the titles of his well known writings are given below.

Brief Sketch of Life.

Born May 12, 1874, at Hirschstetten, near Vienna.

Studied at University of Innsbruck and Louvain. Ph. B. (Louvain), 1894.

Studied medicine at Universities of Vienna, Königsberg and Graz. M. D. (Graz), 1900.

Graduate student at University of Berlin, 1901.

Assistant in Clinic for Diseases of Children (Professor Escherich, Director), University of Vienna, 1902-1909.

Habilitated as Privat-Docent, University of Vienna, 1908.

Principal Scientific Publications.

1. Zur Theorie der Inkubationszeit (The Theory of the Period of Incubation). 1903.

2. Die Serumkrankheiten (The Serum Diseases). (With Schick.) 1905.

3. Klinische Studien über Vaccination und Allergie (Clinical Studies on Vaccination and Allergy). 1907.

4. Die kutane Tuberkulinreaktion (The Cutaneous Tuberculin-Reaction). 1907.

Also a number of articles in medical journals and proceedings on subjects relating to bacteriology, infectious immunity and pediatries.

LISTER PRIZE.

The Advisory Board of the Medical Faculty announces that the sum of $150 has been presented to the Medical Department by Dr. A. E. Malloch, of Hamilton, Ontario, with the request that it be given as a prize to the undergraduate student of the Medical School who shall write the best essay upon "Lister and His Work." The conditions governing the bestowal of the prize are as follows:

1. All essays in competition for the prize must be submitted to the Advisory Board through the Dean's office on or before February 1, 1910.

2. The Advisory Board will award the prize to the essay which in its judgment is most deserving, but it reserves the right to withhold the award in case none of the essays submitted are sufficiently meritorious.

W. H. Howell, Dean.

LAENNEC SOCIETY PRIZE.

A prize of one hundred dollars is offered by the Laennec Society for the Study of Tuberculosis of the Johns Hopkins Hospital for the best paper bearing on any subject relating to tuberculosis presented by a member of the Johns Hopkins University Faculty, or of the Hospital or Dispensary Staff, or any student of the University, or any independent investigator working in any clinic of the Hospital, or in any laboratory connected with the Hospital or University. The conditions of the prize are as follows:

1. All papers must be presented to Dr. W. H. Welch, chairman of the Award Committee, on or before March 1, 1910.

2. All papers must be typewritten and signed by some fictitious name, and must bear no mark to reveal the identity of the author. The paper should be accompanied by a sealed envelope bearing on the cover the fictitious name, and within the true name and address of the author.

3. Original work will be the basis of award, and careful clinical observation will receive as much consideration as laboratory experiments. Mere compilations from the literature will receive no recognition.

4. The paper receiving the prize will be read by the author at the meeting of the Laennec Society in April, 1910, and be published in the Bulletin of the Johns Hopkins Hospital.

5. The unsuccessful papers will be returned to their authors without delay, so that they may make other disposition of them.

6. The Committee of Award may withhold the prize if in their judgment none of the papers are worthy of it.

The three members of the Award Committee are: William H. Welch, M. D., William S. Thayer, M. D., J. M. T. Finney, M. D.

H. Barton Jacobs,
President the Laennec Society.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

January 4, 1909.

Dr. Frank R. Smith, the president, in the chair.

I. Case of Ichthyosis Hystrix. Dr. T. R. Boggs.

Dr. Boggs exhibited this lesion in a white woman of 52, who ascribed the condition to a birthmark due to a maternal impression. Her mother was frightened during pregnancy by a snake. Her belief is interesting in considering the peculiar snake-like character of the lesion.

The lesions were present from birth. They become very hard and thick, and turn black, every spring. The only pain present is from irritation of the clothing. In the summer the scales which have become a finger's breadth in thickness are shed.

There is no history of ichthyosis in other members of the family. The lesions consist of groups of slightly elevated papules covered by dense epithelial crusts which can be scaled off, leaving below them papillæ capped by apparently normal skin. There is no bleeding, soreness, or evidence of inflammation. The papules are distributed in a line along the anterior axillary fold, across the chest to the right breast, ending

at the midline. A similar fine line is seen along the median aspect of the right arm almost in the course of the brachial artery, extending down to the ulnar side of the wrist. There is a small group over the crest of the ilium and another in the right gluteal region. Extending to the popliteal space in the course of the sciatic nerve is a band, 2 cm. in width, of irregular rows of horny-crusted papules. They are continued on the anterior aspect from the knee to the ankle, and they are found upon the second and little toes where the crust of black, horn-like epidermis is particularly thick. Similar lesions are found along the outer edge of the foot and just below the external malleolus.

Dr. Boggs pointed out that the name ichthyosis hystrix means "porcupine" type of ichthyosis, so called from the large, horny outgrowth of the skin. The periodicity is characteristic. The patient sheds her skin when the serpents do. The distribution on the leg along the course of the sciatic nerve occurs in many cases.

Pathologically the lesion is a hyperplasia of the outer layers of the skin down to the mucous layer. An ingrowth or dipping down of the horny layer between the papillæ results in a compression and elongation of the latter. The black color in the spring is due to an increase in pigment—ichthyosis negricans.

The distribution in the course of nerves is only apparent. It is not substantiated by any nerve involvement. It is said to follow Voit's lines, the outer limits of cutaneous nerve distribution, also blood-vessels, and the lines of fissure in the skin, the lines of cleavage when torn. The lines of fœtal growth are mentioned. But none of the explanations cover all of the cases.

II. Investigations Concerning Rocky Mountain Fever. Dr. H. T. Ricketts, Chicago.

Dr. Ricketts exhibited maps showing the distribution of this disease in the Bitter Root Valley of western Wyoming, in Idaho, eastern Oregon, Utah, and Nevada. There is a small focus in Montana and Colorado. In the Bitter Root Valley it occurs on the west side only, a heavily wooded, mining and lumber district. The wood-tick concerned lives on the east side also, but is not liable to such contact with the residents on account of the openness of the country.

As to the disease itself, Wilson and Channing, in 1901, described a microparasite, a pyroplasma. They advanced the tick theory as reasonable for the intermediate host. They implicated the gopher because it comes out of hibernation at the time the ticks and the disease appear. Stiles studied the blood of patients and could not find the parasite. He also discredited the tick transmission.

The disease occurs only in the spring, from late in March to the middle of June in Montana. It is an acute infection with continued fever, enlarged spleen, and a characteristic eruption which is not unlike that in typhus fever. It begins on the wrists and legs. It is macular, but soon becomes nodular and indurated. It spreads over the entire body, the palms, soles, face, and back being included. It becomes hæmorrhagic and coalesces in a few days. The fever varies in height, 101° to 105° F., but is subnormal before death. The pulse is disproportionately slow, 80 to 90, becoming rapid in severe cases—a sign of bad prognosis. There is an early, general glandular enlargement. The cases generally recover.

On autopsy, the only feature is a large, firm, but friable spleen, richly cellular and moderately congested.

Dr. Ricketts began his investigations in 1906. He could not identify the organisms of Wilson and Channing. The inoculation of blood of diseased animals into guinea pigs caused a temperature of 105° and 106° F. after three days' incubation, and death after seven to ten days' illness. This was repeated in three instances. It is possible to infect a second and a third generation if blood is taken on the second day of fever. One hundred and fifty pigs have been inoculated from the same strain obtained in 1906. The pigs lose weight and show a cutaneous eruption similar to that seen in man. Hæmorrhagic slough of the scrotum and gangrene of the ears and the feet occur. In man gangrene occurs in those who recover, but is rare in Montana where the mortality is 75 to 95 per cent. It affects the scrotum, pharynx, and tonsils.

The transfer, of course, is of the virus in the blood, which causes a general infection.

Dr. MacCalla, of Boise, Idaho, found a tick on a human patient. He placed it upon a second person, with his consent, and the disease developed after an incubation period of seven to eight days. The patient recovered. This test was repeated with the same tick and the same result.

Dr. Ricketts made use of the predominating tick of the section; he allowed the female to feed upon an infected guinea pig, and then placed it upon a normal pig. A typical fever developed after seven to eight days of incubation. The pig recovered and later resisted infection, giving a positive immunity test. Other guinea pigs were infected from the same tick. The male tick can transmit the disease as well as the female. The larvæ and nymphæ can acquire the infection, retain it, and transmit it when in the adult stage. In fact, the disease is hereditary in the tick, a germ cell infection, which explains its continued existence from spring to spring.

Considering the source of infection for the ticks, he argued a priori that it must be some animal upon which it feeds. The foci upon the west side of the valley suggested an animal which is segregated and does not wander widely. Experimenting with wild animals he found the gopher, chipmonk, rock squirrel, and woodchuck were susceptible to infection from ticks. They are the hosts of the ticks, have habits of segregation, and meet all the requirements.

The prophylaxis is difficult in that the ticks are probably carried into the holes of these animals. This precludes their destruction.

As to immunity, one attack protects a guinea pig. The serum, however, has no striking curative effect.

Dr. Ricketts pointed out that the disease is not dissimilar to typhus fever. The latter is known to be transmitted by vermin.

The application of wild animals in studying this infections disease suggests new reagents of which use is not being made.

Discussion.

Dr. W. H. Welch.—This is a most fascinating exposition of a new subject. These are model investigations. Professor Koch, on his recent visit, was very enthusiastic as to their value.

The possibility of working with typhus fever is most interesting. It is desirable to study typhus fever with this in view.

I should like to ask if it is similar to yellow fever in that the virus does not appear in the blood until just before death. Is there a cycle of development in the tick? Is the virus filtrable?

Dr. W. S. Thayer.—The mildness of the disease in Idaho is an argument against the disease being typhus fever. No epidemic of typhus fever has been as mild in large districts.

Dr. Ricketts, in reply.—The failure to transmit the disease from the guinea pig after death is probably due to the preponderance of immune bodies in the blood.

There is no cyclic development in the tick. The tick can infect in 24 to 48 hours, or as soon as it can be induced to feed again.

As yet the virus has not been readily filtrable. The work is not yet finished.

III. Study of a House Epidemic of Typhoid Fever. Mr. W. A. Baetjer.

Mr. Baetjer reported the results of his study of a small epidemic of typhoid fever, occurring in a colored family in the country north of Baltimore. Three of the members were admitted to the medical clinic during their attacks.

It was impossible to trace the source of the original infection as the first case died after a short, severe attack, and the rest of the family had no knowledge of her whereabouts prior to the onset. Typhoid fever occurs every autumn in this locality, however, and three years ago an epidemic of five cases occurred in the same house. This fact is of interest in that the whole region forms the northern boundary of the proposed reservoir for the city water supply.

In this recent epidemic nine cases occurred in house No. 1 and eight in house No. 2. The first case developed in house No. 1 in July. In August, after her death, her two children were attacked. Five days later, a husband, wife, and four children of another family in the same house contracted the disease. Nine of the ten people living in the house had typhoid fever, and two died. The diagnoses in these cases were confirmed by positive agglutination tests by Mr. Baetjer.

The water supply of the second house, one mile away, was a spring and a well, both of which were contaminated by drainage from both houses.

The first case, however, in the second household was a constant visitor to house No. 1, and probably received his infection by direct contact. In rapid succession seven members of the second family were taken ill.

Of the nine individuals not ill in this epidemic five had had typhoid fever previously. Out of 26 people, then, living in these two houses, 17 had typhoid fever. The infection in the subsequent 16 cases was due to direct contact with the first case. The source of the original infection could not be traced.

It is interesting that five of seven members of one branch of the family showed an enlargement of the thyroid gland—mother and four sons.

January 18, 1909.

Dr. Frank R. Smith, the president, in the chair.

I. An Experimental Study of the Metabolism and Pathology of Delayed Chloroform Poisoning. Dr. John Howland, New York.

Dr. Howland presented the results of metabolic and pathological studies in dogs poisoned by repeated or long chloroform inhalations. On the basis of percentage differences in the distribution of nitrogen as urea, ammonia, creatinin, or of sulphur in the urine, no distinction can be made on the day of poisoning between a dog that will recover and one that will die. The total nitrogen was increased in all cases. On the next day or two, the animals suffering late poisoning showed an increased output of creatinin, creatin, and sulphur.

Dr. Howland considered the intense destruction of body protein represented by these findings as the result of autolysis—a condition similar to phosphorus poisoning. Wells has pointed out that chloroform interferes with synthetic and oxidative processes without inhibiting autolytic processes. There was no increase in amino-acids and death was not due to an acid intoxication.

The pathological lesions found in these cases resemble strongly those reported in the fatal human cases. In both they are most severe in the liver and consist of central necrosis and fatty degeneration. The same may be said of the kidney lesions. In both there is also a tendency to hæmorrhage into the serous membranes and into the gastro-intestinal tract.

The experiments show that any prolonged anæsthesia with chloroform produces in the dog great alteration and even destruction in liver tissue. Dr. Howland believes that this is true of human beings as well as animals.

II. Ankylostomiasis. Dr. G. H. Whipple.

Dr. Whipple presented the results of his studies upon the presence of hookworms in 232 routine autopsy cases, performed in the Ancon Hospital, Canal Zone, Panama, in the year 1907-8. Hookworms were found in the intestinal tract of 72 cases (31 per cent), only two of which were *whites*. Because of the sanitary conditions upon the canal zone and the fact that most of the laborers wear shoes, Dr. Whipple felt the majority of the cases were infected in their native lands.

The old world hookworm was found in 39 cases (17 per cent); the new world hookworm, in 49 cases (21 per cent). The two were found together in the same case in 25 cases (11 per cent). The new world form predominated in all the heavy infections. In addition the presence of Trichuris trichiura was observed in 17 per cent of the cases and ascaris

lumbricoides in 8 per cent. One hundred and thirty-four cases or 58 per cent were free from intestinal parasites.

It was quite common to note hæmorrhages in the mucosa and submucosa (blood cysts) of the jejunum where the worm was attached or had been feeding. Large numbers of intestinal bacteria invade the mucosa with the worms and set up an extensive inflammation. Blood was found in the worms and Dr. Whipple felt that the worms could digest both red blood corpuscles and epithelial cells. He found worms in blood cysts which he judged from the inflammatory reaction were two to four days old. And these parasites were active and vigorous, and contained blood.

Contrary to Ashford, Baker, Yates, and others, Dr. Whipple does not believe the hæmolysin secreted by the worm is strong or can account for the anemia. As evidence is cited the very slight hæmolysis in a blood cyst of 0.5 cc. which has contained an active parasite for two to three days. The anemia is probably due to direct loss of blood and to the absorption from secondary foci of inflammation in the intestinal walls. The severity depends upon the number of worms and the intensity and extent of this diffuse inflammation.

February 1, 1909.

Dr. Frank R. Smith, the president, in the chair.

I. Surgical Cases. Dr. J. C. Bloodgood.

Dr. Bloodgood reported a series of interesting surgical cases with the aid of the epidiascope and the pathological specimens. Among them was a muscular angioma of the cheek which contained a stone. The vein stone at one end of the tumor had been palpable for a number of years, and the condition had suggested sarcoma. Dr. Bloodgood cited the three cases reported by Dr. Davis in the Johns Hopkins Bulletin for March, 1908.

He exhibited the retroperitoneal glands and the spleen from a case of Hodgkins' disease, showing coagulative necrosis and metastases.

Lymphatic leukemia seldom gets into the surgeon's hands, but Dr. Bloodgood described a small boy with an acute attack of pain in the abdomen, nausea, and vomiting. More interesting was a uniform thickening of the gums as if they were infiltrated with salt solution. Sections showed lymphoid cells below the epidermis, and the circulating blood contained small mononuclear cells to the extent of 71 per cent of the total white blood corpuscles.

Somewhat similar is the condition of multiple myelomata. Dr. Bloodgood showed the skiagraph of a tumor in the outer third of the clavicle. There was no other lesion. This man had complained of pain in the shoulder. He was in good general health. The urine in this case contained the Bence-Jones body. And Dr. Bloodgood noted the importance of examining for this body in all cases of bone tumors.

Several cases of gastric ulcer were described, which disappeared after gastro-enterostomy. Similar relief was obtained in case of a duodenal ulcer. Excision was contraindicated on this account.

II. Fagopyrismus, with Report of a Case in Man. Dr. Henry Lee Smith.

Dr. Smith said that fagopyrismus was derived from Latin *fagus,* beech-tree, and Greek *pyros,* wheat, and meant poisoning from the buckwheat. The condition is not uncommon in pigs, swine, horses, and such animals which eat the grains, plant, straw, or stubble of the buckwheat. White or spotted animals are especially susceptible, and the disease is moderated by shelter or a cloudy sky. It is attributed to fungi on the wheat or intestinal absorption from toxins generated by bacteria or by the sun's rays. An erythematous, itching rash occurs; a nervous type with mania; gangrenous dermatitis; hyperæmia of the brain. The treatment has been withdrawal of the poison, shelter from the sun, purgation, and cooling lotions. The condition clears up under treatment, but reappears in the sunlight. Death occasionally occurs from spasm of the larynx.

Dr. Smith's case was a man who was born in 1863. At the age of nine he ate his first buckwheat cakes at supper. He immediately felt as if there was hot lead in his throat and stomach. There was retching and vomiting. Hives appeared on the face. His eyes were bloodshot. He walked home, a distance of three miles, and was well the next morning. Later he experienced milder attacks and soon learned the cause.

He always experiences the burning sensation. Hives usually appear. And he has respiratory and gastric distress. Emetics relieve him, and recovery is a matter of a few hours. His skin desquamates for some time afterward.

He is on his guard constantly. Other cakes cooked on the same griddle are as poisonous. Pepper adulterated by buckwheat hulls has upset him. He can detect the adulteration by holding the substance under his tongue. Swelling, burning, and salivation make the test positive. Honey from bees which have fed on buckwheat has poisoned him, and a bag of buckwheat in the room caused violent sneezing even when its presence was unknown.

Dr. Thayer and Dr. Cole joined with Dr. Smith in putting the man through a series of tests.

As a cutaneous test, buckwheat was rubbed in a scarification upon the arm with white flour in a control. In a few minutes there were tightness in the chest, nausea, pain in the stomach, cough, a rapid, intermittent pulse, erythema, pruritus, and giddiness. The scarified area developed an urticarial eruption. On account of the irregularity of the heart, the arm was washed and in this way the control contaminated. Then a hive developed there also.

Later a similar procedure was followed, but no buckwheat used. There was no general disturbance. Buckwheat on a bench nearby caused no sneezing.

Finally different unknown powders were put upon the tongue. Many times he failed to detect the buckwheat, but finally gave a slight general reaction when the same buckwheat was employed as was rubbed in the arm.

Discussion.

Dr. W. S. Thayer.—This is a most remarkable picture! The immediate reaction to a slight scratch upon the arm was extraordinary!

Dr. Thayer described a case where from early childhood egg in any form by mouth caused similar symptoms. The life of the individual was made wretched because of the omnipresence of egg in foods.

Dr. Rufus Cole.—Dr. Cole considered this an anomaly in anaphylaxis. Usually hypersensitiveness is obtained by the giving of a small dose, followed by an interval, and then by a larger dose. It was conceivable to him that the patient was being repeatedly sensitized.

III. The Prophylactic Use of Hexamethylenamin in Cerebrospinal Meningitis. Dr. S. J. Crowe.

This paper was published in full in the Johns Hopkins Bulletin, April, 1909.

Discussion.

Dr. Harvey Cushing.—Dr. Crowe has not mentioned his experiments in vitro with the spinal fluid of patients. A patient was given urotropin and then specimens of spinal fluid taken every 15 minutes. These specimens showed graded amounts of urotropin, by color tests, and, when inoculated with organisms, gave graded amounts of organisms on cultivation.

Urotropin is important as a prophylactic measure, indicated in such operations with questionable technique as lumbar puncture, fracture of the skull, operations upon the nose, and in otitis media. Where complications are feared, urotropin produces an uncongenial medium for bacterial growth.

To illustrate the type of case in which urotropin proves a valuable measure, Dr. Cushing exhibited a man who had fallen from a travelling beam headlong on to his face in a mass of iron. The cranium was fractured through the ethmoidal bones, lacerating the right eye and cutting his lip. The seriousness of the injury lay in the fact that there was easy communication between the ethmoidal cells and the meninges. Surgical drainage was instituted and the patient put on urotropin within two hours after the injury. His recovery has been remarkable. There has not been a suggestion of bacterial infection.

This is a measure the eye and ear men will be very grateful for.

NOTES ON NEW BOOKS.

Clinical Diagnosis and Treatment of Disorders of the Bladder with Technique of Cystoscopy. By Follen Cabot, M. D., Professor of Genitourinary Diseases, Post-Graduate Medical School, New York. Illustrated. (*New York: E. B. Treat & Co., 1909.*) Price, $2.00.

This small volume has no marked characteristic to commend it; it is brief, but brevity in surgery is a dangerous quality oftentimes, and a doctor who means to practice genitourinary surgery should not depend on this work for his knowledge; he will do much better to read some of the more comprehensive text-books on the subject. It is doubtful whether the author's practice and advice is that of the best men in these lines to-day.

The Principles of Pathology. By J. George Adami, M. A., M. D., LL. D., F. R. S., Professor of Pathology in McGill University, etc. (*Lea & Febiger, 1908.*)

The fascinating style and the delightful personality of the author, which pervades this entire volume make it quite different from most text-books. The reader's attention becomes arrested without effort, and the interest remains throughout the many pages of theory which are usually so unattractive. The book is abreast with the times in one important particular, and this is the more to be commended since so far this field has not been dwelt upon in text-books on pathology. In the first section the cell forms the central point of interest, and after a histological discussion we are delighted to have the physiology and chemistry of the cell elaborated. There can be but little doubt that we have reached a period when the more intimate knowledge of the physiology and chemistry of the cell must form our means of attacking pathological problems. As the question of the origin of cells, though still remaining in absolute chaos, despite elaborate morphological studies, is on the eve of solution by the application of physiological and chemical methods, so we must agree with Adami that it is far better to prepare ourselves by beginning pathology as he has treated it than by the old method of studying any one system, like the circulatory system.

It was Adami himself who so brilliantly emphasized the evolution which sciences must perforce experience. The stage of hypothesis and wild theorizing, as he expresses it, leads to little good, and even though pathology may have reached maturity in some aspects, it is certainly far from being true that in its newer adaptations a like ripeness has been attained. And so the many theories, which we find in abundance throughout the work, do not help us much in the grasp of the known facts. These are still too meager, and the abundance of complex diagrams do not make a subject of such indefiniteness as enzyme action, growth, or even life, any clearer. How much the study of pathology will be facilitated by such a wide adaptation of the biophoric theory is yet to be seen.

Likewise, although interest does not lag, the relative importance of inheritance, heredity, and the theories concerning these, does not seem to warrant such a lengthy exposition as the author has given to them; nor do the well-known types of abnormalities and monstrosities seem to be deserving of such complete treatment. This becomes more evident since the chapter on bacteria as causes of disease is but brief, as is also the chapter on internal secretion. This latter is rather disappointing. In many places the author puts down still insufficiently confirmed work as facts. His theory that the distention of the vesicles of the thyroid gland may affect the vessels in the alveolar walls and their ability to absorb the contents of the alveoli seems rather fanciful. We do not feel sure from the unconfirmed results of Frankel that the corpus luteum plays such an important function as is indicated, nor do the anatomical and developmental properties of the islands of Langerhans seem to be absolutely settled. Later, in discussing transplantation of the thyroid, Adami says, "The animals die with symptoms of tetany, which follows extirpation of this gland in the cat." Of course this is only a slip of the pen, but it is one

which may greatly trouble the students. On the whole the treatment of the ductless glands and their secretions is very brief in consideration of the recent development of this subject. These deficiencies, however, are forgotten when we reach the chapter on inflammation and repair, which are treated in the same masterly style which has characterized his previous work on this subject. The chapter on immunity is of the same nature. Whether the student is more enlightened or more confused by the numerous and complex classifications of tumors is a question, but the interesting discussion of the predilection of various malignant tumors to metastasize in specific tissues is most suggestive and invites further study.

Briefly the way the author develops the subject seems the only rational way. The style is extremely attractive. There is far too much theory for the book to be of great use to the beginner in pathology. The student regards many of these theories as castles in air, and when he has finished with them has a vague idea of their value. In many places the conclusion drawn from these theories seems to be at fault. Still the scope of the book is broad. It is quite different from any other book which we have on pathology and will be of decided value to the student.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Edited by J. W. Ballantyne, M. D., F. R. C. P. E. Vol. X. (*Chicago: W. T. Keener & Co., 1909.*) Price, $5.00.

Both the editor and the publishers are to be complimented on this work. The task of the editor has not been an easy one, but has been accomplished with skill and intelligence. The publishers have issued the Encyclopedia in an agreeable form, of good size and print. This is the last volume of the series, which is one that any doctor may be glad to own. With such a medical encyclopedia at hand, he is almost as well off as the ordinary person is with the British Encyclopedia. He will find it hard not to find what he wants. The judgment shown in the length of the articles is excellent, the more important subjects receiving their due space; and the information given is apparently quite up to date. In fact, this is a most useful and admirable reference work, and will prove of great help to any student of medicine.

Adenomyoma of the Uterus. By Thomas Stephen Cullen, Associate Professor of Gynecology in The Johns Hopkins University, and Associate in Gynecology in The Johns Hopkins Hospital. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

In a beautifully illustrated and well-printed volume of 270 pages the author gives us practically all that is known of adenomyoma. During the last few years this subject has attracted wide attention, and been the theme of many dissertations, but among the many who have turned their attention to this subject, few have been as well qualified to treat of it as the author of this monograph.

In October, 1894, while making the routine examination of the surgical pathological material from the gynæcological clinic, Dr. Cullen found a uniformly enlarged uterus some four times the normal size. On section the increase was seen to be due to a diffuse myomatous thickening of the anterior uterine wall. As the condition appeared unusual sections were made of the entire thickness of the wall, which disclosed a diffuse myomatous tumor containing scattered bits of epithelium which apparently were continuous with the uterine mucosa. A few months later a second and similar tumor was met with, and a few months later still another. The first case was duly reported at the March meeting of the Johns Hopkins Hospital Medical Society in 1895, although the detailed report of the three cases unfortunately did not appear until the following year. Since then this subject has been of the greatest interest to the author, who has written extensively upon it, and his former monograph, which constituted the supplement to the Orth Festschrift in 1903, was based upon the study of 22 cases.

The present monograph is based upon the study of 73 cases of adenomyoma. These constituted 5.7% of the 1283 cases of myoma which came to the gynæcological laboratory of the Johns Hopkins Hospital between April 1, 1893, and July 1, 1906. Moreover, only the interstitial, subperitoneal, and submucous adenomyomata were considered in this percentage, and the smaller nodules which are quite frequently present in the cornua were purposely omitted from the routine examination. The above is of the greatest interest in showing that this tumor is far from a rarity, and yet the fact remains that it is accorded discussion in only a few of our recent standard text-books. The monograph is in reality a monument to the value of the routine examination of *all* pathological surgical material. We cannot refrain from calling attention to the fact that many of our recent and important discoveries have resulted from such routine work; witness the frequency of malignant degenerations of myoma, the many known facts concerning the futility of the older so-called radical operations for uterine carcinoma, the newer conception of the histological changes in the endometrium, etc. In the majority of institutions uterine myoma have been relegated to slop jars, or have been held of interest only on account of difficulties in the diagnosis or the surgical removal, and the subject of myoma has in general been regarded as closed.

The subject-matter is considered under the general headings of adenomyoma of the uterus, of the cervix, and of the uterine horn and round ligament. For clinical purposes the uterine growths are classed in three groupings, and thus considered, although it is clearly stated that mixed types may occur, as the types may merge imperceptibly from one to the other. The divisions of uterine adenomyoma are given as: 1. Adenomyoma, in which the uterus preserves relatively a normal contour. 2. Subperitoneal, and intraligamentary adenomyoma. 3. Submucous adenomyoma. These types are illustrated by the abstracted protocols of many cases, accompanied by descriptions of the growths which are pictured in their important features by many excellent drawings.

The author has paid especial attention to the etiology of this disease, and has grouped his cases with this view in mind in nearly all possible combinations. As a result of careful study of the cases reported in 1896, he concluded that the adenomatous elements of the tumor were derived from the glands of the endometrium in his three cases, thus differing from the theory which already had been advanced by von Recklinghausen, that usually they owed their origin to the remains of the Wolffian ducts. The case which von Recklinghausen took as the type rather resembled one of Cullen's earliest cases. v. Recklinghausen's tumor presented a peculiar glandular arrangement, in that in various areas several glands opened into a chief canal, which after passing a short distance became dilated, thus forming an ampulla. This appearance so strikingly resembled the microscopic remains of the Wolffian body, that von Recklinghausen concluded that the glands were derivatives of that structure in that case, in spite of the fact that the glands of the tumor reached the surface of the tumor in several places. v. Recklinghausen believed that the growth encroached upon the uterine cavity, caused partial atrophy of the mucosa, and thus allowed the glands of the tumor to open into the uterine cavity. He admitted, however, that the glands might be derived from those of the mucosa, and described another case in which he thought this was the case. As time went on, the majority of investigators favored the view of the derivation of the adenomatous elements from the remains of the Wolffian ducts. This phase of the subject, therefore, has long been of the keenest interest to Cullen, who has constantly studied his cases with this point in view. Serial sections have

been made from the various tumors until connection between the glands in the depths of the tumor and the mucosa could be proven, and in fifty-five or fifty-six cases of diffuse adenomyoma of the body of the uterus, was he able to demonstrate that the glandular elements of the tumor were derived at least in part from the uterine mucosa. The amount of work necessary to elucidate this point is apparent to any one who ever has worked in a laboratory. As earlier, Cullen believes that these glands are derivatives of the endometrium because they still retain their menstrual functions, as in nearly every instance in which cyst spaces are present, the cavities are partially or completely filled with blood, and even in the small and undilated glands blood is frequently present, or else the epithelial cells contain blood pigment—the remains of former hæmorrhage. This blood is held to be menstrual, and may present alterations in appearance just as does that in hæmatocolpos. The amount found in the cysts varies in accordance with the location of the cyst. It would be expected that the cysts in the uterine wall would attain only small size as they are constantly compressed by the muscle, and on the other hand when the cyst projects under the peritoneal surface, and are no longer so firmly compressed, they may dilate until they contain even several litres of chocolate-colored menstrual fluid. Moreover, typical uterine mucosa can be demonstrated in the solid portions of some parts of the tumor, not only by the appearance of the glands and the stroma on microscopic sections, but also because a typical conversion into decidual cells has been noted when the case has been complicated by pregnancy. The case recorded by Williams, in which the uterus of a woman dying two hours after labor was found to be the seat of a diffuse adenomyoma, the stroma of the glandular elements of which had been converted into typical areas of decidua, has been followed by a case described by Cullen. In this latter instance the case presented an unruptured tubal pregnancy of one side, and a subperitoneal adenomyoma of the other uterine horn. Here again the stroma of the adenomyoma had been in part converted into decidua, although the adenomyoma was at least 9 cm. away from the tubal pregnancy.

When we review the author's material from the standpoint of the origin of the glandular elements of the tumor, we find that in fifty-six of seventy-three cases of adenomyoma of all locations, viz., subperitoneal, submucous and interstitial, direct communication could be traced between the adenomatous elements and the uterine mucosa. Yet these figures are strengthened by the consideration of the tumors according to their various classifications. Thus some tumors were large and some were small. Moreover, few would demand that the continuity of the uterine mucosa into the depths of the tumor be shown in all classes of tumor in order to prove the origin as given, provided that the communication be proven in the interstitial and submucous forms, because we all believe that fibroids are usually interstitial in their earliest stages, and in their subsequent growth are displaced either inwards or outwards. In case the tumor developed outward, the continuity between the glands of the tumor and the uterus easily could be broken. As a matter of fact, there were eight cases of subperitoneal adenomyoma, and in no instance could the connection be demonstrated. There were seven cases of submucous growths. Some of these consisted in diffuse myomatous growths containing only a few small glands, while in others the glands had become cystic. In one case the myoma was fairly riddled with miniature uterine cavities which could easily be traced to the cavity of the uterus. There were fifty uncomplicated cases of diffuse adenomyoma of the uterus, some very extensive, others in the early stages. The uterine mucosa was traced into the myomatous tissue in all instances. In six other cases the adenomyoma was associated with squamous-cell carcinoma of the cervix, and in only one of them was there failure to show the continuity. There were two cases of diffuse adenomyoma of the body associated with adenocarcinoma of the body. In both cases the uterine mucosa had been converted into carcinomatous tissue, so that naturally the picture was so overshadowed by the cancer that the continuity of the glandular tissue could not be demonstrated. Thus, in only one of fifty-six cases in which the investigator expected to find that the glands of the tumor had developed from the mucosa, did he fail to do so. The above is quite sufficient to convince the majority of us that von Recklinghausen's theory cannot apply to a large proportion of cases.

The same general laws of the development of submucous or subperitoneal types of growth, holds alike for myoma and adenomyoma. As we have already indicated, the growths are interstitial at first and are displaced either inward or outward in their subsequent development. When they become subperitoneal, the glandular elements of the tumor gradually lose their continuity with those of the mucosa. This theory is well substantiated by the case reported by Lockstaedt, in which the development of a subperitoneal growth from an interstitial could be seen, and in which the mucosa could be seen extending deeply into the tumor.

From a survey of his cases the author concludes that at least in some instances, the myoma antedates the formation of the glandular elements: thus, he reports two cases and cites others from the literature in which a diffuse myomatous growth existed without an invasion of the glands. Other points bearing upon the etiology have been considered, although the cause for the development is still unknown. Contrary to the findings of W. A. Freund, Cullen has been unable to find that sterility or a previous infantile condition of the uterus was a prominent feature as an etiologic factor, inasmuch as only fifteen of forty-nine patients in whom the relation to pregnancy had been ascertained had never been pregnant, and of these six were unmarried. Nor would it appear that pregnancy with its incident stretching of the uterus leaves crevices into which the mucosa later could extend, as this explanation could not hold in the large proportion of cases that never had been pregnant. Of the forty-nine cases, thirty-two had had children, and two had had only miscarriages. The children averaged four to each one of thirty-one women in whom there was accurate records of the number of children born. In a few instances the woman had only one child, while in other cases there was a history of ten, eleven and thirteen children. Thus, it is found that the disease may exist in single, as well as in married women, and furthermore that it does not seem in any way to follow, nor yet to militate against normal pregnancy.

The age was investigated in 66 patients. The tumor was found in women as young as nineteen and as old as sixty, yet only five of the 66 patients were not between the ages of 30 and 60. Nearly one-third of the cases were found respectively in each decade between 30 and 40, 40 and 50, and 50 and 60. The development of the growth appears to be slow, as many patients dated the onset of symptoms five or ten years previous to the operation.

Forty-five cases were carefully examined to determine whether there was any causal relation between disease of the tubes and ovaries and the development of adenomyoma. None was found. Yet the interesting point was determined that in thirty cases there were more or less dense adhesions of the appendages on one or both sides. The adhesions were taken by the author to result from a mild degree of pelvic peritonitis, presumably caused by the diffuse myoma in most cases, although rarely other and more usual causes were found in the tubes. The pathological changes in the ovaries were such as are usually found in a corresponding number of abnormal adnexa examined in the laboratory routine. The uterus was found more or less adherent in twenty-four of forty-nine cases, showing the tendency of the tumor to form adhesions. The adhesions were usually confined to the

posterior surface of the organ and only rarely were noted on the anterior surface.

Adenocarcinoma of the corpus was found in two cases in which the cancer could be demonstrated as developing in the glandular substance of the tumor. One of these cases also strongly suggested the independent development of a sarcomatous growth of the body of the uterus. The co-existence of diffuse adenomyoma of the body and squamous-cell carcinoma of the cervix was noted in five instances. As would be expected, the symptoms of the latter naturally completely overshadowed those of the former, and the adenomyoma was not suspected until it was found in the post-operative routine examination of the uterus.

Three cases of adenomyoma of the round ligament are reported together with citation of other cases from the literature. The author believes that the glands in these cases are also derived from Muellerian tissues.

A resumé of the symptoms makes it appear possible the diagnosis can be made in many cases before operation. Cullen gives the following reasons for his belief: A case in which there is a diffuse uterine growth which is apparently a myoma can generally be diagnosed as an adenomyoma when, 1, there is a history of an ever-increasing menstrual discharge generally confined to the period; 2, dull aching or grinding pains during the periods in the uterus or down the back and thighs; 3, no intermenstrual discharge of any kind whatsoever; 4, curettage yields a rather thick but normal mucosa. As a rule no other pathological condition of the uterus gives this picture. The increased hæmorrhage is due to the participation of the mucosal structures of the tumor in the menstrual function, and the pain is due to the retention of the blood in the glandular spaces, and the subsequent dilatation of the latter.

On account of the diffuse nature of the growth as well as the great frequency of pelvic adhesions this disease cannot well be treated by myomectomy, and supravaginal hysterectomy is advocated. The author shares the general belief that adenomyomata are benign and cites a case in which a woman from whom a wedge-shaped portion of the growth was removed in 1895, remained well and free from symptoms during the space of eleven years, and was so up to the time of the publication of the book. That incomplete myomectomy is not always so successful in the cure of symptoms is shown by another case which was not relieved until later subjected to hysterectomy. There was, however, no development of malignancy.

The volume is a faithful record of an investigation which has extended over the long period of thirteen years. The amount of work essential to the elucidation of this subject has been absolutely enormous, and is scarcely hinted at in the text. Nor will one be able to appreciate the extent of such a labor who has not done the routine work of a large laboratory. The volume is everywhere characterized by systematic and careful work, and although a monograph, an unnecessarily large portion of the text is not consumed by the history of cases, which are presented only as abstracts and to illustrate the salient features. The illustrations are beautiful and for the most part are the work of Horn and Becker, although the wonderful drawings of Broedel, which illustrated the earlier papers of Cullen on this subject, are included. The illustrations present the novel feature of being tinted instead of the more usual black color. To our mind this is a pleasing and agreeable departure. The publishers have presented a most attractive volume, well printed in large and clear type, and handsomely bound, which makes the whole a delight to the eye.

In conclusion we congratulate the author upon presenting to the scientific world another monograph worthy of his reputation and the school.

FRANK W. LYNCH.

Contributions to the Physiological Theory of Tuberculosis. By CHARLES CREIGHTON, M. D., Sometime Demonstrator of Anatomy, Cambridge Medical School, Etc. Price, 12/6. (*London: Williams & Norgate, 1908.*)

The text, consisting of 238 pages, is divided into three parts.

Part I. Histogenesis of Experimental Tubercle.

The author gives a summary of previous researches on Histogenesis. Referring to the advent of cellular pathology he says: "Incidentally the cellular pathology involved a separation of true tubercle, as an interstitial connective-tissue neoplasm, from the infiltrations, exudations, etc., both caseous and gelatinous, which Laennec had included along with the miliary nodules. The distinction has not been made good, etc." (p. 3).

Baumgarten's theory of the histogenesis of tubercle is contrasted with that of Metschnikoff; the former holding that the bacilli stimulate the fixed connective-tissue cells and endothelial cells of the blood-vessels to change into epithelioid cells in which the bacilli are found and which may increase in size and contain two or three nuclei.

Metchnikoff's theory is that the small granular polynuclear leucocytes first gather the bacilli and engulf them. After a few days these cells are destroyed and large mononuclear cells, which meanwhile have arrived on the scene, absorb the detritus of the polynuclear cells and the bodies of the bacilli, and from this two-fold pabulum grow to be epithelioid cells, and some to giant cells.

The author also reviews those studies of the blood in connection with the histogenesis of tubercle, and then takes up what he calls the "Select Experiment-Species," *i. e.*, the rabbit and guinea pig. These animals have been used because they are convenient rodents and because of the certainty and rapidity of their infection with pure cultures of tubercle bacilli.

Peculiarities of the blood are stated to exist in these animals and stress is laid on the presence of glycogen in the tissues.

The following criticism of the use of the guinea pig is rather surprising: "If human or bovine tuberculous tissues should happen to have few or no bacilli, or from any reason to be ineffective for inoculation purposes, a sure way to make the argument from them go is to inoculate in a guinea-pig, and to use its spleen. But does anyone know the natural capabilities of the guinea pig's spleen as infective material? Is there an unusually powerful ferment in its pulp for the reduction of red blood corpuscles? What is the meaning of its histological peculiarities in the fœtus, in ordinary, and in pregnancy? Usage has brought this organ into a position of great importance in the logic of experimental tubercle, and yet its natural properties are little known, and are assumed to be negligible" (p. 27).

The author proceeds to a discussion of the histogenesis of tubercle in various organs of the rabbit and guinea pig, using a considerable amount of his own material and drawing extensively on the literature for evidence corroborative of his views, often interpreting the findings of other observers in a very different way from their interpretation of the same. It is a somewhat difficult task to pick out from the great mass of citations which are interjected throughout the entire text, the author's own views.

The following quotations, some of them rather widely separated in the text, and not set down here in the order in which they occur, perhaps summarize the author's views: "The primary effect, and sole direct effect, of the bacilli is upon the red blood corpuscles" (p. 57, under discussion of "the spleen of the tuberculized rodent"). To this altered state of the blood the author ascribes certain other changes in the histogenesis of tubercle. "As to the endothelium of blood-vessels, my attention was called to it first in studying the meningeal arteries of tuberculous children, from which one gets the impression very strongly that the endothelium must have been softened or rendered glutinous, or

otherwise altered, by the quality of the blood constantly passing over it, so that blood-discs stuck to it, penetrated amongst its cells, and even collected in heaps between it and the elastic lamina. But in the pulmonary veins at large in the tuberculized rabbit one may find proof positive that the endothelial lining has been acted on by the blood passing over it" (pp. 38 and 39).

It will be seen later that the above observations are very significant of the author's theory of the histogenesis of tubercle.

I digress just a moment to make one observation. If the changes in the endothelium of the veins are due to the quality of the blood constantly passing over it, one would expect the same changes to be produced on the endothelium of the arteries, but the author declares in his account of the effect in the lungs of intravenous inoculation in the rabbit, "One finds the arterial endothelium normal" (p. 39).

Composition of a Tubercle.—"The bulk of the tubercle is a protoplasmic tissue, trabecular or syncytial or plasmodial, with large nuclei usually vesicular and clear. This is the distinctive tissue of all rodent tubercle, whether in the lungs, lymph-glands, spleen, kidney or liver" (pp. 42 and 43). This characteristic tissue is, as I understand it, nothing other than the epithelioid cells of other authors.

Now the first *evident* change in the formation of tubercle the author believes to be thrombosis. This thrombosis leads to diapedesis of red blood corpuscles. The extravasated blood is broken down under the influence of a ferment which the author derives from certain pre-existing cells. In case of the lungs, "the karyokinesis of the leucocytes (as well as of the alveolar epithelium) is in relation with the dissolution of the red blood corpuscles" (p. 29).

In this connection the author refers to an earlier paper in which he "illustrated the disruption of the hæmatoblasts on the inner wall of a sero-sanguineous cyst of the dog's neck to yield red blood corpuscles" (p. 29). The phenomenon which he there described was the disruption of the nucleus of certain cells connected with the detachment of pieces of the outer or protoplasmic zone to become red blood corpuscles. Applying this observation to the formation of the epithelioid cells of the tubercle he says: "What I have now to urge is, that the same fragmentation of nuclear chromatin, and the same clinging of the nuclear particles to red blood corpuscles, is found in the building up of the large mononuclear protoplasmic cells in rodent tubercle; they are built up from the substance of blood-discs by the action of nuclear chromatin (e. g., of a leucocyte) where the blood is thrombosed within the vessels or extravasated into the air cells, ... the one process being an assimilation of blood-discs (or their substance) to make large protoplasmic (epithelioid) cells, the other being a dissolution of the protoplasm of large epithelial-like perivascular cells to yield the blood-discs: the karyokinesis is the same in both, but the end is reversed" (pp. 29 and 30).

The epithelioid cell being the peculiar and characteristic element of the tubercle it is of interest to see how the author derives it in the various organs of the body.

In the lungs he believes that they are probably derived from the alveolar epithelium.

With reference to their origin in the liver the author says: "In the larger portal branches from which the thrombus has been dislodged, the endothelial cells are greatly thickened, with large and highly chromatic nuclei and with blood-granules in their protoplasm, the original mosaic pavement being still recognizable. So far as my observations go, I would not make the liver-cells contributories to the tubercle" (p. 54).

In the spleen the pulp-cells are the elements which eventually develop into epithelioids. "The variety of appearances is such that it is hardly possibly to generalize them, otherwise than to say that the pulp-cells are becoming epithelioid cells by reducing and assimilating the substance of red blood corpuscles" (p. 58).

In the description of the histogenesis of lymph-gland tubercle it is not perfectly clear what the origin of the epithelioid cell is; "large multinuclear or giant-cells are rare, elongated or spindle-cells are common, but commonest of all are the epithelioid cells, with enormous nuclei, which may be joined by their ends to form the kind of syncytium already described for the lung and spleen. In very fine sections it is still possible to see a certain relation of this tissue to the walls of the capillaries" (pp. 60 and 61).

To trace the author's views of the histogenesis of the giant-cell would be even more difficult than has been the task of arriving at the origin of the epithelioid cell. The following from page 44, under histogenesis of the tubercle in the lungs of the rabbit, indicates one theory of their formation advanced by the author: "Some part of the thrombus may become a giant-cell; and the reason why the bacilli are found most usually within giant-cells is that the latter are intravascular formations, or thrombi organized in a peculiar way."

In Part I, Histogenesis of Experimental Tubercle, the author makes a primary injury to the red blood corpuscles the essential underlying principle in the histogenesis of tubercle. This injury to the red blood corpuscles enables them to be broken down under the influence of the ferment-like action of certain cells, and the resulting products furnish the pabulum on which these cells develop into the component elements of tubercle.

The author does not assume the presence of the bacilli at the site of the tubercle to be always an essential, as evidenced by the following: "Inasmuch as tubercle bacilli are few or altogether wanting in all forms of liver tubercle, whether spontaneous or experimental, excepting where masses of them had been thrown direct into the portal blood, we may conclude that the noxious agent need not be actually bacterial, but some substance which doubtless arises from bacteria in the experimental case, and is able to coagulate the portal blood, not from its excess in that region, but because the blood in the portal vein is peculiarly susceptible" (pp. 51 and 52).

In Part II, Placental Analogies of the Rodent Tubercular Neoplasm, reviewing the results described in Part I of injecting tubercle bacilli into the venous blood of rabbits, the author states that the ultimate textural result in the lungs, liver, spleen and lymph-glands (all organs of blood renewal) is the same in all, "namely, a rich protoplasmic nucleated tissue, which has been called plasmodial not inaptly, and is often a true syncytium from the fusion of several nuclear territories, being a peculiarly rodent neoplasm" (p. 62).

In this Part the author proposes to show "that a similar plasmodial or syncytial tissue is built up, also from the substance of reduced red corpuscles, in the placenta—notably similar in the two rodent species, but not different in kind in the chorionic villi of the human placenta; . . . . that the indeciduata have a peculiar provision, on the amniotic and allantoic surfaces, for the deposit of hyalin and caseous waste from the fœtal blood, which represents a part of the placenta of the deciduata, and is an equally good analogy for the dead matters of tubercle; . . . . That the process of caseation in rodent tubercle is just the same as in the rodent placenta (guinea pigs)."

I shall not attempt to follow the author through the complexities of his "Placental Analogies." To do this successfully, much more to attempt any critical review of the evidence submitted, would require a histologist well versed in embryology and pathology.

In the section VIII, "Present State of the Argument from Experiment," one is surprised to find this statement, "Amongst the hundreds of papers of the last ten years, ... it is hardly possible to find one which does not assume that human tubercle is an infection, and that the bacillus of Koch is the infective agent. It is a wonderful unanimity on the nature of a great disease—a disease almost damned in a fair theory. Yet the doc-

trine of a specific bacillary cause has been all the while in a state of flux; it has been modified by its author; and if it be scrutinized closely as it now stands, it will be found to be beset with difficulties and paradoxes" (p. 120).

Referring to the lesions produced by the butter bacillus, the hay bacillus and others, he says: "The way out of the labyrinth is to follow the clue of histogenesis in each particular case, and to drop all idea of conformity or nonconformity to an absolute structural type, as if there were any such due to any bacillus" (p. 127).

In the light of the "Placental Analogies" it is hard to see how histogenesis will lead out of the labyrinth; indeed, one almost wonders if it is possible to differentiate, by histogenesis, a case of miliary tuberculosis from a normal pregnancy.

In Part III, Human and Bovine Tuberculosis, the point of view from which the author approaches the pathogenesis of bovine and human tubercle is as follows: "Nearly the whole of bovine tubercle is a chronic disorder of nutrition, to which breeding may predispose in a very high degree. A large part of human tubercle is also chronic and a disorder of nutrition, to which also breeding predisposes greatly. For the acute cases of practice, especially in children, there may be analogies among the experiments; but they are far more likely to be found in the experiments with complex proteids ("tissue fibrinogens") than in those with bacteria. Infants and children must often receive as food complex proteids—for example, in the milk of anemic cows—which are absorbed undigested into the portal blood or the lacteal lymph, and may even produce extensive portal thrombosis, or, at all events by their cumulative action, a state of the blood which favors minute multiple thromboses of the meningeal arterioles, of the terminal pulmonary arteries, of the interlobular veins of the liver, of the splenic arterioles, etc.

"No experiments on the smaller mammals can ever reproduce the manifold circumstances of human and bovine tubercle; but the results of the experiments as they have impressed the whole profession, so ought they to be analyzed critically to find their points of agreement with the tuberculosis of experience. It is then seen that there is nothing specifically infective common to the two, but only such a histogenetic process as was to be looked for in the respective circumstances, the physiological analogy for it being found in the neoplasm by which the nutrition of the fœtus in the utero is carried on at the expense of the reduced red corpuscles of the mother" (pp. 134 and 135).

It would be of interest to know the author's views on the histogenesis of cancer and sarcoma. What is the "pabulum" on which the cells feed to produce the malignant neoplasm, and if this, too, is reduced to red blood corpuscles, what is the primary agent which so injures the blood that it may be dissolved to form this "pabulum"?

In Part III the author discusses human and bovine tuberculosis, all the cases referred to being described as "spontaneous tubercle" —a term apparently used in contradistinction to tuberculosis experimentally produced.

He then considers in order, lymph gland tuberculosis, with reference to lymph glands in syphilis, tumor cases, etc., the formation of hyalin in tuberculous lymph glands, bovine pearl-disease, its physiology and the occurrence of mast-cells in it, the occurrence of similar structures on the serous surfaces of human beings, which led the author in an earlier paper to advocate the theory of the transmission of the bovine disease to man; and meningeal, splenic, hepatic, pulmonary, and internal tubercle as arising spontaneously in man and bovines.

Throughout this section the same phenomena of thrombosis and dissolutions of the red blood-cells to furnish the pabulum of cells which go to form the tubercle are observed.

An interesting observation is that on hæmoptysis in pulmonary tuberculosis. "The blood brought up in the beginning of phthisis is often so unattended with signs of violent reaction, being sometimes even without the incitement of coughing, that there is every reason to look for its source in passive congestion of the mucous membrane of the bronchi.

"Nothing has occurred in the subsequent study to affect the original conclusion that hæmoptysis, in the great majority of cases, comes from an unbroken, passively congested mucous membrane, and only in occasional instances (usually fatal at once) from a ruptured small aneurysm of the pulmonary artery or from the eroded end of an artery (a rare thing) in a cavity" (pp. 230 and 231).

The author evidently does not consider hæmoptysis to be due to the presence of tubercles, but to the cause which led to the formation of tubercles, namely, an antedcedent venous stasis.

I have not attempted a critical review of the author's work, for which I frankly confess my incompetence, but have sought rather a descriptive account. The text is fully illustrated with drawings which are pertinent and clearly explained.

The author displays a wonderful knowledge of the literature of the subject which he brings into relation to his own views, often interpreting the results of others in a different way from that in which they did.

The style is very difficult, owing to the frequent interruption of the narrative by parentheses and citations from other authors. There is scarcely a paragraph which does not contain one or more parentheses or citations, and often both.

The language in places is fantastic, but the humorous similes are apt and furnish momentary relaxation from the strain of trying to follow the intricacies of the subject, for which the reader is grateful.

The author is a severe critic of those whose work he has noticed, and early in the book he enters upon a lengthy and caustic criticism of the Histological Report of the Royal Commission on Tuberculosis (the present British Commission), which does not seem wholly relevant, even if just.

W. L. Moss.

BOOKS RECEIVED.

Scientific Memoirs, No. 35 (New Series). By Officers of the Medical and Sanitary Departments of the Government of India. *Black-water Fever.* By Captain S. R. Christophers, M. B., I. M. S., and Dr. C. A. Bentley. 1908. Fol. 239 pages. Government Monotype Press, Simla, India.

The Baby. A Book for Mothers and Nurses. By Daniel Rollins Brown, A. B., M. D. 1908. 12mo. 200 pages. Whitcomb & Barrows, Boston.

Diseases of the Digestive Canal. (Œsophagus, Stomach, Intestines.) By Dr. Paul Cohnheim. From the second German edition. Edited and translated by Dudley Fulton, M. D. [1909.] 8vo. 373 pages. J. B. Lippincott Company, Philadelphia and London.

American Practice of Surgery. A Complete System of the Science and Art of Surgery, by Representative Surgeons of the United States and Canada. Editors: Joseph D. Bryant, M. D., LL. D.; Albert H. Buck, M. D. Complete in Eight Volumes. Profusely Illustrated. Volume Five. 1908. 4to. 965 pages. William Wood and Company, New York.

Mind and Its Disorders. By W. H. B. Stoddart, M. D., F. R. C. P. With Illustrations. 1909. 8vo. 488 pages. P. Blakiston's Son & Co., Philadelphia.

Orthopedic Surgery. By Henry Ling Taylor, M. D., assisted by Charles Ogilvy, M. D., and Fred H. Albee, M. D. With two hundred and fifty-four illustrations. 1909. 8vo. 503 pages. D. Appleton and Company.

Text-Book of Diseases of the Nose, Throat, and Ear. By Francis R. Packard, M. D. [1909.] 8vo. 369 pages. J. B. Lippincott Company, Philadelphia and London.

Retinitis Pigmentosa, with an Analysis of Seventeen Cases Occurring in Deaf-Mutes. By William T. Shoemaker, M. D. Laboratory Examinations of the Blood and Urine by John M. Swan, M. D. With illustrations and three colored plates. [1909.] 8vo. 106 pages. J. B. Lippincott Company, Philadelphia.

Text-Book of Gynecological Diagnosis. By Dr. Georg Winter, with the Collaboration of Dr. Carl Ruge. Edited by John G. Clark, M. D. After the third revised German edition. Illustrated by four full page plates and three hundred and forty-six text illustrations in black and colors. [1909.] 4to. 670 pages. J. B. Lippincott Company, Philadelphia and London.

Surgical Diseases of the Abdomen. With Special Reference to Diagnosis. By Richard Douglas, M. D. Second edition, revised and enlarged. Edited by Richard A. Barr, B. A., M. D. Illustrated by twenty full page plates. 1909. 8vo. 897 pages. P. Blakiston's Son & Co., Philadelphia.

Illustrations of the Gross Morbid Anatomy of the Brain in the Insane. A Selection of Seventy-five Plates Showing the Pathological Conditions Found in Post-Mortem Examinations of the Brain in Mental Diseases. By I. W. Blackburn, M. D. 1908. 4to. 154 pages. Government Printing Office, Washington.

Experimental Researches on Specific Therapeutics. By Prof. Paul Ehrlich, M. D., D. Sc. Oxon. The Harben Lectures for 1907 of the Royal Institute of Public Health. 1909. 16mo. 95 pages. Paul B. Hoeber, New York.

Bacterial Food Poisoning. A Concise Exposition of the Etiology, Bacteriology, Pathology, Symptomatology, Prophylaxis, and Treatment of So-called Ptomaine Poisoning. By Prof. Dr. A. Dieudonné. Translated and edited, with additions, by Dr. Charles Frederick Bolduan. Authorized translation. 1909. 8vo. 128 pages. E. B. Treat & Company, New York.

Blood Examination in Surgical Diagnosis. A Practical Study of its Scope and Technic. By Ira S. Wile, M. S., M. D. 1908. 12mo. 161 pages. Surgery Publishing Company, New York.

Seven Hundred Surgical Suggestions. Practical Brevities in Diagnosis and Treatment. By Walter M. Brickner, B. S., M. D., Eli Moschcowitz, A. B., M. D., and Harold M. Hays, M. A., M. D. Third Series. 1909. 16mo. 150 pages. Surgery Publishing Company, New York.

Studies in Puncture-Fluids. A Contribution to Clinical Pathology. By. O. C. Gruner, M. B., London. 1908. 8vo. 289 pages. P. Blakiston's Son & Co., Philadelphia.

Clinical Diagnosis and Treatment of Disorders of the Bladder, with Technique of Cystoscopy. By Follen Cabot, M. D. Illustrated. 1909. 8vo. 224 pages. E. B. Treat & Company, New York.

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THE LIFE AND TIMES OF GERHARDT VAN SWIETEN.

Born 1700, at Leyden. Died 1772, at Schönbrunn.

"Simplex veri sigillum."*

By Dr. A. G. Gerster, New York.

The printed material available for the study of Van Swieten's life is prineipally eontained in the excellent monographic article by Heeker,[1] in his great work of medical biography; in Eloy,[2] then in a series of artieles by Morel, in the Gazette Hebdomadaire,[3] of the years 1853 and 1854. Dezeimeris' Dietionary, Blake's biographical Dictionary, and Hirsch's similar work offer only the scantiest data of a general nature. As to the personal life and charaeter of our man, his remarkable relations with Maria Theresa, his friendships, loves and hatreds, his habits of work and play—in short, as to his more intimate individuality—our knowledge is very seanty. What little there is has been drawn from the funeral oration, delivered on September 7, 1772, before the University of Vienna, by the Rev. Father Ignatius Wurz, Societatis Jesu, Doetor of Theology and Professor of Eloquence (Printed by Joseph Kurboeek, Vienna, 1773, 12°). Father Wurz's effort, though rhetorical as the occasion required, has the stamp of sineerity, and the statements it contains seem to be authentie and trustworthy. At any rate, they have never been contradieted.

Research of the epistolary and other material of a documentary eharaeter, which must be extant in the Archives of the University of Vienna, in the Arehives of the Austrian Ministry of Instruction, and in the hands of private men, would yield abundant and extremely interesting stuff for the study of the man, his epoeh, and the intricate and seeret history of the fundamental work he did in establishing the first great clinical school of medieine. Such a biographical study would be worthy of the highest literary talent.

Let us now rapidly eonstruct the historical background which served as a setting to Van Swieten's life. At the time of his birth, Holland's position was in every way eminent. Having victoriously emerged from her eighty years' war for political and religious liberty, Protestant Netherlands acquired not only enormous wealth and prosperity through trade, but by the freedom of thought and speech her laws and customs eneouraged, she beeame one of the acknowledged centers of intelleetual progress. She was the safe refuge of the persecuted from all realms, of Protestants as well as of

* Motto of Van Swieten's baronial arms.

[1] Biographies médicales.

[2] Dictionaire Historique de la Médecine, Mons, 1778.

[3] Van Swieten, sa vie et ses écrits, pp. 213, 429, 453 and 517.

revolted Catholics. Those that prefer exile to conformity have always been distinguished by intellectual elevation and force of character, hence we may say, that herein Holland was the gainer. Her flourishing schools were teeming with life and progress. Her printing industry had assumed truly amazing proportions. Everything censured and forbidden by church and court influence appeared in print at Amsterdam. In spite of the most unremitting vigilance, this intellectual contraband found its way across guarded frontiers, and reached those who were eager to receive and enjoy the forbidden fruit. In Catholic France the revocation of the Edict of Nantes had extirpated Protestantism, and the issuing of the Papal bull "Unigenitus" having led to the wiping out of Port Royal and Jansenism, the domination of the Jesuits became unquestioned. In the hereditary crownlands of Austria, the battle of the White Mountain had sounded the deathknell of Protestant resistance. Those whom the sword and the halter had spared, the irresistible pressure of confiscation and vexatious persecution compelled to emigrate. To this period (1730) America owes its Salzburger colonists who settled in Georgia, and indirectly the accession of the Moravians of Bethlehem. The interminable revolts in Hungary, provoked mainly though not altogether by religious causes, did not end until the Peace of Szathmar, 1714, had guaranteed to the Protestants free worship and full control of their own colleges. As the summary measures, employed in the Austrian crownlands had been found inapplicable in Hungary, a system of propagandism, by fair means and by any means, principally by bribery through court favor, was instituted, a system presided over by the Society of Jesus, and known in history under the name of "counter-reformation." Public instruction came under the direct or indirect control of the Jesuits, and remained there until Pope Clemens XIV, abolished the order in 1773. It is difficult for Americans to conceive the full measure of the all-pervading power and influence of this famous order. Repression of all tendencies to freedom in politics and religion, and the inculcation of unquestioning submission to authority were their cardinal tenets, and were enforced with suavity if possible, if not, with tyrannical severity.

Naturally, under this régime, the universities were the first to suffer, and under Charles VI, the father of Maria Theresa, we find at the University of Vienna an unprecedented state of stagnation. As they were the nurseries for future ecclesiastics and for the men who aspired to public office, the faculties of theology and law were well attended by students. The philosophical and medical faculties, on the other hand, reached then their lowest level of intellectual degradation. To illustrate this, it may be mentioned that in 1723 there were matriculated only 23 students of medicine at the University of Vienna. The teaching was purely didactic, and in every way mediæval. There was no chair of anatomy until the year 1736, and the newly created chair remained unfilled until 1739—its first three incumbents being absolute nonentities. Dissections were rare, and during the year 1742[4] none whatever were held.

However, it would be unfair to omit to state that, bad as the case of the universities was at the hands of the Jesuits, their management of the middle grades of public instruction was excellent. Their methods were rational and thorough, and the results were so well appreciated, that before entering into Protestant colleges or migrating to Protestant German or Dutch universities, many Protestant students were sent by their parents to Jesuit Gymnasia.

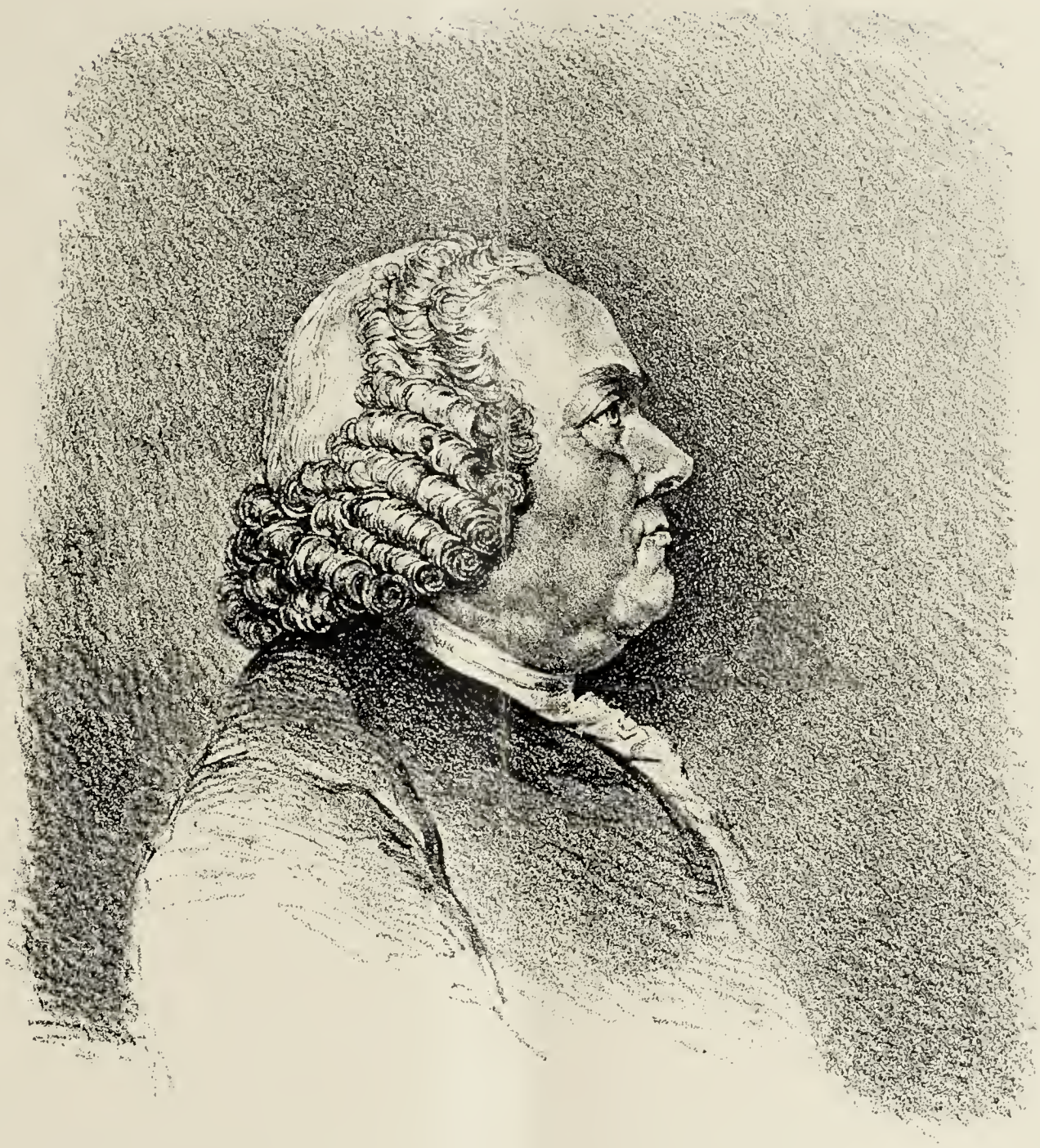
The reason of the neglect of philosophical and medical studies is to be sought in the fact that these imply free inquiry, the questioning of authority, and the exercise of free judgment. These conditions are the soul of all true science, and because they are subversive to the habit of submission to dogma and authority, they were consciously discouraged.

This was the state of public—more especially of medical—instruction in Austria at the time of Maria Theresa's accession to the throne in 1740. She was then twenty-three years old, and it is well known what obstacles and dangers she had to contend with during the war of the Austrian Succession and the two Silesian wars, which filled the first years of her reign. The time of the accession of Maria Theresa and of Frederick the Great, marks the beginning of a struggle between the houses of Hapsburg and Hohenzollern, that was to last over one hundred and twenty years, and was not to end before the final defeat of Austria at Königgrätz in 1866.

The mediæval despotism of Austria was sustained by the support of a servile and grasping aristocracy, a conceited and retrograde hierarchy, and a motley army commanded by mercenary officers, drawn to a great extent from the impoverished nobility of all the nations of Europe. The cynical and shameless pursuit of dynastic interest had been the sole preoccupation of the immediate predecessors of Maria Theresa, but especially of her father, Charles VI. The fanatical repression of Protestantism, however, had its inspiration as much in dynastic self-interest as in narrow bigotry. The rise, out of the unpromising Hapsburg stock, of an imposing figure, such as we find to have been the Queen of Hungary and Bohemia, is a remarkable and interesting event. Her youth and her whole life remained unspoiled by the moral contamination that overspread Europe from the cesspool of French corruption under Louis XIV, the Orleans regency, and the Court of Louis XV. The fearful dangers through which she had to fight her way from the very beginning of her reign, only helped to call forth the fine mettle and unshakable courage of this virtuous and virile-minded woman.

Her native intelligence and force of character, goaded by the necessities of impending danger, as much as by the successful example of her main adversary, the unprejudiced and progressive young King of Prussia, soon taught the young Queen to break through the iron trammels of ossified usage and tradition, to recognize antiquated and inefficient conditions inherited from the supine administrators of preceding

[4] Neuburger and Pagel, Geschichte der Medicin, Vol. II, p. 204.



SWIETEN.

reigns, and to reach out for the aid of modern men fit to repair the effects of long-standing neglect and incapacity.

When Maria Theresa ascended the throne, that part of the Netherlands which corresponds to present-day Belgium was still an Austrian possession. Many liens of a common history, of blood and interest, persisted between the Dutch Republic and its Catholic sister. In the latter, a respectable measure of modern progress in arts and sciences was irresistibly induced by mere propinquity to Holland. Louvain attracted Catholic students from Holland, while the Protestant subjects of Maria Theresa frequented Leyden, this exchange naturally leading to mutual assimilation of ideas, to emulation, and to salutary rivalry. Evidently the great difference between the energy manifested by the schools of the Netherlands, and the lethargy that dominated Vienna, did not escape the attention of Maria Theresa.

Gerhardt Van Swieten was born at Leyden on May 7, in the year 1700, of Catholic parents. His father, Thomas, and his mother, Elizabeth Van Loo, were of old Dutch stock, and of noble quality. The history of the Van Swietens went back to the XIV Century, they having multiform relations of blood with the best families of the Low Countries. In spite of persecution, and against their material interests, they had remained steadfast Catholics. They had furnished to their country statesmen, jurists, soldiers, and administrators of distinction and merit.

Gerhardt received his first training in the Latin school of his native town, where his alacrity and studiousness attracted attention. While at this school, he lost both parents. The care of the orphan devolved on certain guardians who, according to Father Wurz, shamefully neglected the boy's temporal and spiritual interests. The reverend Father's acerbity seems to indicate, that the boy frequenting a Protestant school, sufficient attention was not paid to church attendance, confession and communion, and also that his clothing and personal cleanliness were neglected. Whatever this may mean, his zeal and unguided energy overcame all obstacles. He graduated with honors, showing special proficiency in Greek and Latin—in those days the "*sine qua non*" of eminence in the learned professions. At sixteen, he was sent to Catholic Louvain, to prepare himself for an administrative career, to which, following family tradition, his parents had destined him. The mastering of law and of administrative science was the proper purpose of his sojourn. He not only absorbed all that was offered, but found time to cultivate modern languages, mathematics, chemistry, physics, and the natural sciences—for all of which he had developed an early and eager predilection. From the beginning, his teachers became aware of the good parts of the boy—intelligence, penetration, practical sagacity and good judgment, together with dogged industry and a prodigious memory being mentioned by them. The great diversity of his studies, notably useful notions of the law and of administration acquired at Louvain, were to him of the utmost utility in his later career as organizer and administrator. The study of a wide range of human knowledge was in the air at the time, and this passionate acquisition of manifold information led to the rise of the French encyclopædists.

Boerhaave's fame undoubtedly made the young man, an omnivorous reader, to take curious cognizance of his writings, and the great teacher's spell, thus cast over Van Swieten, was strong enough to determine a change of career. Accordingly, we see him at eighteen returned to Leyden, and sitting at the feet of the Master, whose lectures he followed from this time on for twenty consecutive years. Boerhaave was then fifty years old and at the zenith of his European fame. Immediately their relations became close and cordial, and remained unchanged until the Master's death. After seven years of medical study, Van Swieten was, in 1725, graduated Doctor of Medicine. The theme of his inaugural thesis was "De arteriæ fabrica." On this occasion Boerhaave took pains publicly to designate him as an equal, and the worthiest of his pupils to become his successor. Contemporary authors all dwell with sympathetic interest on the touching relations of friendship that subsisted between these two remarkable men. Sincere manifestations of Van Swieten's exemplary modesty crop out frequently on the pages of his life's work, "The Commentaries." This sentiment, the depth of which cannot be questioned, led to his steadfast self-effacement, to the very end, before his Master, Boerhaave. Throughout his long life the great physician, organizer, statesman, and favorite of the Empress Maria Theresa, consistently and proudly proclaimed himself a mere pupil of his teacher. All he knew, all that he accomplished was attributed to the influence of Boerhaave. In the preface to the Commentaries, we read the often quoted sentence: "It has been my good fortune to have an opportunity of attending Boerhaave's lectures, both public and private, for the space of near twenty years. What I hold to be still more fortunate, during all that period, I have had the honor of being admitted to a large share of his friendship and conversation, and have been allowed to consult him freely upon every difficulty which occurred. These advantages have been peculiar to myself."

To nothing except these relations must be attributed Van Swieten's unwillingness to write down his medical knowledge, original in many respects, in the shape of an independent work. His avowed preference was to figure as a mere commentator of his teacher. To the individualism and egotistic trend of our days, this sentiment is almost incomprehensible.

In 1729, Van Swieten married Maria Lambertine Theresa Beck Von Coesfeld, daughter of an ancient and noble family, issued from Cassel in Hessia, from whom he had two sons and two daughters. We find mention of a serious illness befalling him in the early years of his marriage. Excessive application to study, and the lack of recreation and exercise seem to have produced a profound mental and physical depression, easy to recognize as a form of grave neurasthenia. Father Wurz's funeral oration thus describes the condition: "To search for the fundamental principles of the sciences at their very sources; to renounce, for the sake of solid work, all society; to enclose one's self in solitude, unbroken even by the hours of repast; to neglect taking nourishment until forced by

necessity; to rob the nights of required rest; thus to continue until the overburdened spirits fall into a state of sombre and sad melancholy, and the exhausted body succumbs to the load; until bodily strength disappear; sleep vanish, and food and recreation become a source of disgust—to this régime, maintained for several years, led the immensity of the labors of Van Swieten," etc.

Boerhaave, who had been mildly protesting against these excesses, finally became seriously alarmed. Fortunately, earnest remonstrances, and the evident necessities of the case, did not fail to bring about a radical change of habits, and a cure of the malady. In 1736, against much Protestant opposition, overborne, however, by Boerhaave's influence, Van Swieten was appointed Professor to the Chair of Materia Medica. Immediately his lectures became very popular, especially among the English students. This very popularity, however, was the undoing of the young Professor's ambition. An old law, forbidding the occupancy by a Catholic of public office in Holland, was invoked by envious Protestant rivals, and Van Swieten had to relinquish his chair. Thus we see, that in this instance, Catholic intolerance found a worthy counterpart in Protestant meanness. As soon as the issue became public, an outraged and generous student body arose in riotous protest. The instigators of the intrigue against Van Swieten were waylaid, mobbed, and but for the energetic personal intervention of Van Swieten himself, would have sustained serious bodily damage. On this occasion, as well as ever afterward, one of the leading traits of our man's character proclaimed itself. It was a pronounced aversion to strife and controversy. In all his writings you will search in vain for even a single sentence conceived in the polemic spirit so common in those days. When conviction compelled divergence, Van Swieten always found a proper way of robbing dissent of its sting. Morel states, that the sharpest dart he ever fired into an opponent, was that used in reference to some erroneous ideas on the bile, advanced by a Dr. Simson. The term, "candidus vir," that is, a naïve, simple-minded man, or simpleton, is immediately toned down by the remainder of the phrase, which runs thus: "Ex cujus scriptis me plura et utilissima didicisse lætus recordar," *anglice*—"From whose writings I gladly acknowledge to have learned many and most useful things." May it not be inferred that the pacific attitude of Van Swieten was rooted in a lack of the sense of humor, a disposition to take things over seriously, and also in the instinct of the well-bred man, who loves above all good form and suavity? The difference between Van Swieten and his illustrious schoolmate and successor in the Chair of Medicine at Vienna, the pugnacious, witty, and aggressive De Haën is very pronounced.

Shortly after his retreat from the Chair of Materia Medica, a tempting offer was extended to Van Swieten to settle in England, where an annual fixed income of 1000 pounds, to be derived from the interest of a capital deposited *"ad hoc,"* was to secure him against care. He declined the offer, the main reason therefor, according to Father Wurz, being his disinclination to live in a country, where Catholic public worship was a crime, punishable under the laws of the realm. Thus we see him remaining very content at Leyden, at peace with himself and the world, enjoying the pleasures of a studious life spent in the friendly atmosphere of his beloved master, Boerhaave.

It would be extremely interesting to shed light upon the factors that determined the first contact of Maria Theresa with Van Swieten. In the absence of facts at our disposal, we may be permitted to bring forward a legend, that circulates to this day at the University of Vienna regarding the first service Van Swieten had rendered his mistress at the time following her nuptials to Francis of Lotharingia, in 1736. The young princess was a robust, tall, earnest, and unspoiled girl of nineteen, who, thoroughly impressed with the importance of her future position, had been spending the best of her time in the company of an array of male teachers of ripe age. In studies, the enthusiastic pupil needed restraint rather than encouragement; she was made to seek recreation in outdoor sports, especially horseback exercise, which suited her energetic and fearless disposition. Latin, according to usage, was the language of her instruction, and she acquired such a mastery of the idiom, that she could not only maintain, with much adroitness her side of a learned dispute, but could "ex tempore," deliver a lengthy address, called for by any occasion, and undismayed by a numerous audience. Her Latinity was much praised by experts. Beside the ancient authors, her studies embraced the political and administrative sciences, law, and all the accomplishments that were indispensable to a person of her high destiny. She revelled in the company of men distinguished in learning and state-craft, and combined with the ingenuousness of a young girl a remarkable precocity with much force of character. Having thus been brought up like a young man rather than a girl, she entered wedlock in absolute innocence of mind and body. The genitive instincts of the young bride of nineteen were under the glacial burden of much learning, and her aversion to the intimacies of the married state were such an obstacle to the hope of future progeny, that it became a subject of serious care and embarrassment to the court. The legend says, that acceptance of the advice of Van Swieten, delivered in solemn consultation, speedily overcame the difficulty, its application resulting in pregnancy, and the happy delivery of a princess.

The bare facts, as known to us, say that the first volume of the Commentaries had appeared in 1741; in 1745 it was followed by the second; and immediately after this the Queen extended to him a flattering call to move to Vienna and to become her "Leibarzt." As motives that may have prompted her action, we may mention: First, the shameful state of all medical affairs in the realm, an absence of talent and capacity, compelling her to go abroad for a competent physician in ordinary; then, the urgent desire, prompted by her keen sense of a sovereign's duty, to remedy the scandal. As to the choice of the man, we may say that he was then the foremost pupil of the famous Boerhaave, was a man of well-known talent, of good breeding and unquestioned integrity; and last, but perhaps not least, that he had borne persecution for their com-

mon Catholic faith and, though tempted with gold, had, on account of conscientious scruples, declined to enter heretical England. She would thus do a noble deed by exalting one worthy and persecuted, would acquire the services and gratitude of a man of unquestioned eminence and utility, and would at the same time teach the Protestant Dutch a useful lesson.

Not without hesitation, Van Swieten finally accepted the Queen's offer, and we see him arriving in Vienna on June 7, 1745. This migration marks the closure of the first epoch of his life, an epoch devoted to the acquisition of knowledge for knowledge's sake, warmed by the glow of the friendship of Boerhaave, embellished by the affections of family life and by the simple pleasures of a student's existence at a small university. He had acquired little practice, but a modest patrimony afforded him all the liberty and comfort that were necessary to a scholar's contentment. The change from the happy but bourgeois mediocrity of Leyden to the pomp and circumstance of the imperial court of Vienna, must have meant a veritable revolution to the habits of the student and recluse. The promptness with which middle-aged Van Swieten was able to adjust himself to the radical change, testifies to the elasticity and energy of his temper. Surely there could have been little in his makeup of the rigidity of the book-worm and pedant.

The first sign of the Queen's satisfaction with her protégé was his elevation to the barony. The motto selected by himself for his arms was characteristic of the man: "Simplex veri sigillum."[5] Undoubtedly, the mutual understanding so quickly established between him and the Queen was based on many points of agreement in their characters. Both were serious in the conception of their duties; both religious without an excess of formalism and bigotry; both just as resolute and fearless in facing ugly facts as they were energetic in meeting them by action. The friendship and kindness of the sovereign, famous for her simplicity and almost bourgeois directness of manner, were reciprocated by the sincere and earnest devotion of Van Swieten. He felt no hesitation in suggesting improvement where there was need for it. Plain-spoken, but as to manner always polished, he evidently possessed the rare art of awakening and maintaining the Queen's interest in whatever he laid before her, for otherwise how could the curious fact be explained, that in the midst of the tremendous cares of her great wars she found time to institute, through his agency, all the incisive reforms that actually took effect shortly after his appearance at Vienna.

The foremost of these innovations was the successful establishment on a great scale of the clinical teaching of medicine. Teaching at the bedside was unknown then both in Germany and Austria. We find its first rudiments in Padua, where, about 1558, Bottoni and Oddo are mentioned as having occasionally demonstrated patients to their students. Their example was imitated for a while at Pavia and Genoa, but in the 17th Century all trace of the movement had disappeared except at Leyden, where, between 1602 and 1632, at the Collegium Practicum, bedside demonstrations were given in a desultory manner. The official establishment of a public clinic at Leyden was determined by the marked falling away of the number of students, caused by the attraction of the great fame of Professor Straten, of the newly-founded University of Utrecht. To meet this dangerous competition, Leyden, under the direction of Otto Heurnius, organized a public clinic with twelve beds, to which students were to be admitted twice weekly. Autopsies were to supplement clinical teaching. At first the students did not take kindly to the innovation, preferring the conventional didactic lecture *ex cathedra,* so that not rarely the professor had to make his rounds unaccompanied by even one student. The fate of the new way hung in the balance for a long time, but its advantages were so manifest to the successors of Heurnius, that after him Albert Kyper, and then about 1658, Francis Sylvius de Boé, then about 1715 Bildoo, courageously maintained the tradition, until Boerhaave's great personality appearing, the matter became settled forever. The battle begun by Roger Bacon against the chimæras of scholastic learning, continued by Francis Bacon, who emphasized the hollow worthlessness of preconceived theory compared with the evidence of well-observed fact—this battle was to be brought to a final issue in the modest clinic of Leyden. Here it was that Van Swieten became thoroughly saturated by Boerhaave's discipline, and the happy combination of a great principle arming the hands of a great man, with a great opportunity properly seized, resulted in the establishment of modern medical teaching.

Van Swieten, having been appointed professor to the Chair of Medicine in 1746, had, on account of the lack of a suitable lecture-room, to begin his teaching in the vestibule of the court library (Hofbibliothek). Immediate steps were taken, however, to supply what was wanting, and the adaptation of existing and the erection of new buildings were commenced. At this time he made a gift to the medical faculty of his large and valuable collection of anatomical preparations, which, according to Hyrtl, still forms the kernel of the anatomical museum of Vienna. Maria Theresa, much impressed by the energy and success of her "Leibarzt," was easily induced to notice the shortcomings of all other branches of public instruction. The result was, that the whole matter of higher instruction was entrusted to Van Swieten. In quick succession he became Director of the Army Medical Service and of the Imperial Library.

Until this time, this, one of the richest collections of books then extant was inaccessible to the public. Van Swieten not only threw open the library to everybody, but his practical sense provided a well-lighted reading-room, properly furnished with writing materials and heated in cold weather, so that visitors could comfortably follow their studies and make notes and excerpts. This innovation met with resistance, but Van Swieten's determination overcame the opposition.

In those times, except in Holland, the official censure of all printed matter was an accepted prerogative of government.

[5] Originally this was Boerhaave's own motto; it was adopted without change by Van Swieten.

This duty naturally devolved on the court librarian, Van Swieten. As he, himself, had tasted the bitter fruits of religious persecution, he exercised the functions of this office with moderation and good sense. It is difficult to determine how much his own convictions and how much pressure from above had to do with his forbidding the circulation of the works of the French encyclopædists. This repressive attitude brought down upon him the hatred and scorn of these iconoclasts, by one of whom, Voltaire, he was pleasantly apostrophized as "a tyrant of the mind, and (in his capacity of physician) an assassin of the body."

All other branches of university teaching beside medicine were vivified by his influence, the philosophical faculty receiving its share of attention. New chairs were established in mathematics, astronomy, physics, chemistry, and the several branches of natural history—even philology not escaping his interest. He, himself, began the study of Hungarian and Arabic.

The multiplicity of his onerous duties finally compelled him to cease teaching, but he provided a worthy successor in the person of the fiery De Haën, who was installed in 1756. Gasser was called to the chair of anatomy, Stoerck to that of pharmacology, and young talented men, sought out sedulously by himself, were dispatched abroad to absorb new knowledge, later to be utilized in teaching.[6]

In the selection of suitable personalities for the multiplicity of posts to be filled, Van Swieten showed remarkable tact and talent. In the Austria of those days, more even than to-day, court favor had everything to do with the filling of appointments. Van Swieten's good sense, integrity and firmness of character, backed by the unswerving trust of the Queen, knew how to meet undue influence exercised on behalf of pushing mediocrity. No blandishment or threat of aristocratic or clerical backers of unworthy candidates could ever make him deviate from a selection made after due deliberation. His kindness to talented young men issuing from the humbler walks of life, was proverbial, and was practically attested by the foundation of many scholarships. The care of the widows and orphans of medical men also engaged his solicitude, and led to the organization in Vienna of one of the greatest societies devoted to this purpose.

In 1763, the new university building was inaugurated. At the order of their Imperial Majesties (Francis and Maria Theresa having attained their new dignities), the oil portrait of Van Swieten was apposed to a conspicuous wall of the aula, with the following inscription:

Franciscus I, et Maria Theresia Augg.
Hanc effigiem
Gerardi L. B. Van Swieten,
Ob Studium medicum ab ipso feliciter emendatum
In auditorio hujus facultatis publice appendere jusserunt
Die XXX. Decembris, MDCCLXIII.

[6] To those who wish to study the effects of the first Vienna school upon the development of medicine, the work of H. Lebert, "Ueber den Einfluss der Wiener Schule des 18ten Jahrhunderts auf den positiven Fortschritt in der Medicin, Berlin, 1865, can be warmly recommended.

In another direction, Van Swieten's personal influence brought about great amelioration. Convinced that, to do their best, men of science must enjoy a certain material ease and a reasonable independence from sordid cares, he induced the Empress considerably to augment the perquisites and salaries of the University teachers.

Though multiform and onerous duties, scrupulously and diligently fulfilled, much retarded, they did not interrupt his literary activity—notably, the finishing of the Commentaries, the fifth and last volume of which did not appear until 1772, that is, shortly before his death. Besides this, he found opportunity to write an excellent manual on the diseases and injuries affecting the army,[7] then a Latin work on the London epidemics, and a number of other treatises of less extent.

To illustrate the scientific significance of Van Swieten, we cannot wish for a better document than his famous Commentaries. In them he adopted Ramsay's method. Each one of Boerhaave's aphorisms serves as the text for a monograph, embracing all that in those days was known of the subject.

His temperamental soberness and reserve made him a peculiarly fit exponent of the transitional era in which he lived. The respect for authority, especially for the ancients as transmitted by clerical scholasticism, is still apparent in his text; but facts as facts are not distorted to fit the rigid frame of preconceived theory. The readiness of the scholastics to furnish a cut-and-dried explanation for every conceivable fact, and their alacrity to ascend through pure dialectics to the primary cause of everything, are absent from Van Swieten's manner. His unbiased and sensible attitude of mind is well illustrated by the following anecdote. He once said:

People are amused by the words of Molière's candidate of medicine, who declares that opium produces sleep because its virtue is soporific; yet he said all that could at the present be said on the matter.

His love of truth as he understood it, his freedom from controversial bias and preconception, are refreshing to observe at a time, when the bad manners and vicious acrimony of religious polemics had found their way into medical literature. Of this Von Haller and De Haën offered most reprehensible examples. Van Swieten's inclination to begin each inquiry by observation, and to argue and theorize therefrom, becomes more and more manifest as we progress from the first to the last volume of the work. Whenever the premises are insufficient, he honestly admits the fact, and declines to draw conclusions. To this attitude of mind is to be attributed Van Swieten's critical sifting and simplification of the prevailing and grotesque pharmaceutical notions of his time. He inspired the first attempts at physiological experiment made by Stoerck, who studied the effects of certain poisonous plants, as, for instance, aconite and hemlock on the living body.

Boerhaave's hostility to inoculation was reflected in Van Swieten by the milder attitude of simple evasion; but when

[7] There is strong reason to assume that his authorship of this opuscle is apocryphal: *Willibald Müller:* Gerhard van Swieten, Vienna, 1883.

Maria Theresa, herself, contracted the small pox in 1767, the good sense of the Empress over-rode her physician's lack of faith. She ordered all her household inoculated, though not without first gaining Van Swieten's formal assent.

Up to Van Swieten's time the treatment of syphilis had remained in a barbarous state, excessive salivation being considered indispensable. Observing the fact, that in many instances the malady had the tendency to run a self-limiting course, he concluded that the immoderate use of mercury was unnecessary and harmful. Precursor of this view was the "cura per extinctionem," that is, the "expectant" method that had originated at the school of Montpellier. In 1754 he succeeded in securing for Maximilian Locher the appointment of Director of St. Mark's Hospital, in which all cases of syphilis were then collected. Under his direction, Locher began the methodical use of small doses of the watery solution of corrosive sublimate, first in the strength of one-quarter of a grain to the pint of water. To test the tolerance of the patient, this was gradually increased. Results were very encouraging, many cures succeeding without any salivation whatever. At this time it happened that a Portuguese student named Ribeiro Sanchez, having recently returned from St. Petersburg, told Van Swieten of the employment of the same drug by an old Russian surgeon, who dissolved one grain in two ounces of brandy, administering the solution in teaspoonful doses. Immediately the matter was put to the test, and having been found reliable, the new preparation was admitted to the pharmacopœa under the name of "liquor Swietenii."

As to the literary character of the Commentaries, we may first note the concise, yet lucid Latinity of its text, to which, in a great measure, must be attributed the long popularity of the work. The author's immense erudition is attested by over five hundred references to ancient and modern authors.

Six years after the arrival of Van Swieten at Vienna, that is, in 1751, a young man by the name of Leopold Auenbrugger was appointed to the vacant position of physician to the Spanish (military) Hospital. Ten years later, Auenbrugger published his "Inventum novum," the result of seven years' research, containing the first exposition of what we now call physical diagnosis by percussion. As Auenbrugger was the immediate pupil of Van Swieten at Vienna, and repeatedly refers to his master in the text of the "Inventum," it is not conceivable that the fact of the discovery of this new and valuable aid to diagnosis should have remained unknown to Van Swieten. The fact is, however, that no mention is made of Auenbrugger's epoch-making discovery in the last two volumes of the Commentaries, published in 1764 and 1772 respectively, though they contain two long treatises on pulmonary phthisis and on pleuritic effusions. De Haën, Van Swieten's successor in the Chair of Medicine, paid no more attention to the work of Auenbrugger than did his predecessor. Though mention was made of the new invention in two or three of the scientific periodicals of the time, the great contemporary authorities failed to recognize its importance. Most of those who noticed the "Inventum" did not even grasp its meaning, confounding "percussion" with the "succussion" of Hippocrates. Abstaining from a criticism of Van Swieten's attitude in the matter, we shall let it rest after having stated the facts. Auenbrugger's invention, failing to attract the notice of the leaders in medicine of his time, fell into oblivion until 1808, when Corvisart, Napoleon's physician, recognizing its surpassing merit, translated the "Inventum" into the French language. According to the ways of human nature, this meritorious invention, like others, was accepted by the countrymen of the inventor only after a foreigner of distinction had put the seal of his approval to it. Corvisart's translation was followed by Laennec's and Skoda's labors, which, in turn, made the modest Styrian's discovery the universal possession of the world.

Up to the year 1769, we see the great physician and administrator indefatigably directing the arduous work of intellectual and practical regeneration, smoothing the ways for everything that seemed to him salutary and progressive, steadfastly supported in everything by the confidence and energy of the great Empress. In that year, however, his health began to suffer from an increasing disorder of assimilation. Aging rapidly, he tired quickly, complained of coldness in the limbs and of recurrent pains in one leg, symptoms suggesting to our mind intermittent claudication. Evidently, his arteries were degenerating, for in March, 1772, a bleb appeared on one of the toes, and after the detachment of the slough, the phalanx became exposed. Knowing that his end was approaching, he hastened the publication of the final volume of the Commentaries, and had the pleasure of seeing his life's work completed. When spring had set in, the Empress arranged for his removal from the city to the salubrious airs of Schönbrunn. His declining days were cheered by her frequent and familiar visits. She called on him the last time a week before his death. This ensued from gangrene of the leg on June 18, 1772. Sustained by a steadfast faith, he bore his affliction with exemplary cheerfulness and resignation.

At his death, the grief of the Empress manifested itself in a long and passionate fit of crying. By her orders, his statue was erected in the aula of the University. His body was interred in the crypt of the Augustins, where it reposes with the ashes of illustrious soldiers and statesmen. The memorial service held in his honor at the University of Vienna was mentioned at the beginning of this paper. A similar tribute was accorded to his memory by the Paris Academy of Sciences, where, on April 21, 1773, an oration was delivered by the Secretary, M. de Fouchy. However, the most perennial monument, erected by himself to his own fame, was the firm establishment of the clinical method of teaching medicine and surgery. Vienna's example led to its rapid and universal acceptance in Germany and abroad. It also laid the foundations for the development of the second school of Vienna, the exponents of which were Rokitansky, Hyrtl, Brücke, Skoda, Oppolzer, Hebra, and Billroth.

To the traits of Van Swieten's personal character, heretofore mentioned, we may add one or two more, adduced by Father Wurz. His temperament was ardent and impetuous.

and whenever amongst his subordinates he met with inexcusable negligence, but especially with a veiled passive opposition, he was apt to be carried away by just indignation. But the very hotness of such an explosion exercised upon him a sobering effect. Unqualified condemnation was first modified into friendly remonstrance, then turned to kindly advice, usually ending in apologies proffered to the culprit for the violence of the well-merited rebuke. His native love of honesty and truthfulness was so strong, that from the moment a fault was frankly confessed without subterfuge or tergiversation, his forgiveness was assured. Deception and lying, however, were invariably followed by merciless expulsion from office.

It is needless to state, that the injection of such an energetic and aggressive character as Van Swieten's into the stagnant life of the Vienna court, stirred up many a hornet's nest, and must have been the cause of endless intrigue. His very ingenuousness and abstention from strife and underhanded plotting, won for him the unfailing confidence and support of the Empress. Their relations remained untroubled and cordial to Van Swieten's death.

A great consulting practice and the emoluments of office naturally permitted him to accumulate a modicum of wealth, a large proportion of which, however, was spent in aiding the indigence of less fortunate colleagues, their widows and orphans, both in Holland and Austria, and in furnishing means to needy but talented students, numbers of whom were regularly aided by him in pursuing their studies at home and abroad.

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The foregoing sketch easily permits the conclusion that without the possession of a broad foundation of general knowledge, both theoretical and practical, Van Swieten's career could never have attained its epoch-making importance. To fulfil such a task, much more than mere professional eminence was required.

The principal work of Van Swieten, his Commentaries to the aphorisms of Boerhaave, have seen a number of editions in Latin, and have been repeatedly translated into the English, German, French, Spanish, and Dutch languages. The "Kurze Beschreibung und Heilungsart der Krankheiten, welche am oftesten in dem Feldlager beobachtet werden, Trattner, Wien, Prag, und Triest, 1758," was also translated into French, English, Dutch, and Spanish. A posthumous book was "Constitutiones epidemicæ et morbi potissimum Lugduni Batavorum observati, ex ejusdem adversariis edidit Maximilianus Stoll." Vienna and Leipzig, 1782, 2 vols.

His first publication was the inaugural dissertation, "De arteriæ fabrica," Leyden, 1725. I also find the title of an "oratio de senum valetudine tuenda," which was published in Vienna in 1778.

THE "MODERATOR BAND" AND ITS RELATION TO THE PAPILLARY MUSCLES, WITH OBSERVATIONS ON THE DEVELOPMENT AND STRUCTURE OF THE RIGHT VENTRICLE.

By Robert Retzer, M. D.,

(*From the Anatomical Laboratory, Johns Hopkins University.*)

The recent researches of Tawara (1) '06, have shown that the "moderator band" in the sheep, which he designates as simply "Muskelbalken," constantly contains the right branch of the conductive system. My own work (2), '07, confirms this. In a large number of pigs' hearts I have found the "moderator band" to consist of nothing but fibers of the conductive system, together with the constantly accompanying nerves and blood-vessels. In these cases, which formerly were called "hearts with fibrous moderator bands," the position was identical to that of the stout muscular band usually present. If the modified Purkinje fibers in the right branch of the conductive system have any power of contraction, it must be very slight, and in view of the fact that in the left ventricle identical cells certainly do not prevent any hyperdilatation of the ventricular wall, we can safely assume that the moderator band does not moderate, but is important only in so far that it contains the right branch of the conductive system. For reasons to be discussed later, I shall call it the "trabecula supraventricularis."

The constancy of this trabecula in some hearts and its absence in others led me to examine more closely the structure of the right ventricle. After examining over 200 pigs', 40 dogs' and as many human hearts, I came to the conclusion that the presence or absence of the trabecula was entirely due to the position of the anterior or large papillary muscle. It was only after this conclusion was reached that a search was made in the literature for the originator of the term "moderator band." Gould, in his Medical Dictionary, and other authors speak of it as Reil's band, but no mention of it could be found in any of the numbers of Reil's "Archiv für Anatomie," nor in the list of his published works. Many terms are associated, apparently without reason, with the name of this celebrated anatomist, and I doubt not that this is the case with the term "moderator band." In a further search in old books, I finally found an article, buried in Guy's Hospital Reports of 1837, by W. T. King (3), '37, entitled, "An Essay on the Safety-Valve Function in the Right Ventricle of the Human Heart, and the Gradations of this Function in the Circulation of Warm-blooded Animals," and on page 122 of this article, King says: ". . . . it seems calculated to limit distention, and therefore I have called it the moderator band of distention."

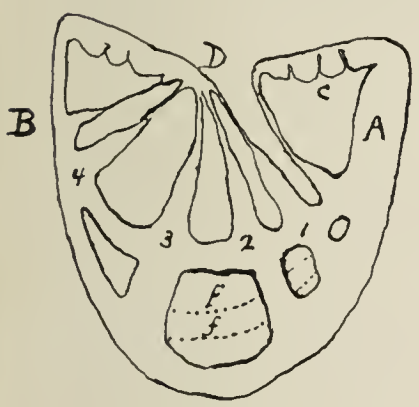
With the exception of McDonald Brown (4), '89, and Fothergill (5), '72, I find no reference to this most interesting contribution to the comparative anatomy and physiology of the heart, and in view of the fact that the old Guy's Hospital Reports are accessible to but a few anatomists, I shall take the liberty of reporting on it at length, quoting it verbatim.

King's study is arranged with especial reference to 300 or more preparations of hearts in the Museum of Guy's Hospital. The anatomical terms are as follows:

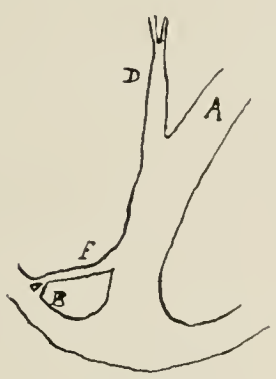
Column of distention	meaning	papillary muscle.
Curtain of distention	"	the valve on the parietal wall.
Solid wall	"	septum interventriculare.
Yielding wall	"	the anterior or parietal wall.
Moderator band of distention	"	trabecula supraventricularis.

The paper consists of three parts, viz.:

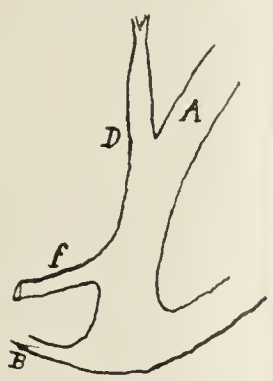
I. Of the safety-valves in man.
II. Of the safety-valves in mammalia.
III. Of the safety-valves in birds.



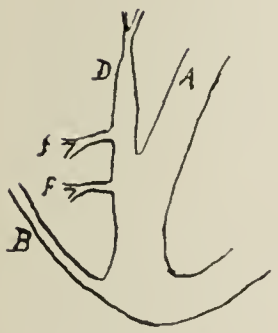
Diag^m 1.



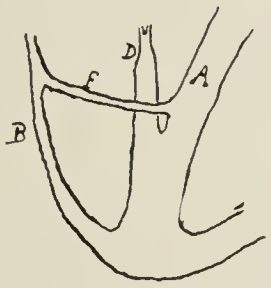
Diag^m 2.



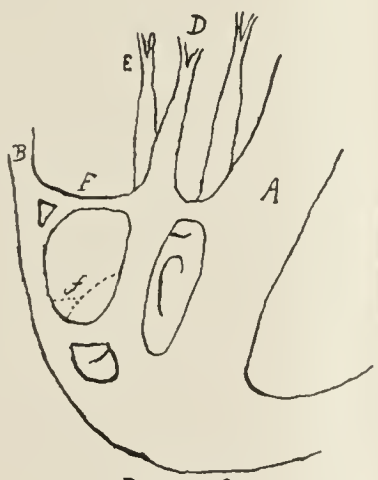
Diag^m 3



Diag^m 4



Diag^m 5



Diag^m 6.

It is the second part of this paper which is of interest to us, and it alone will be considered. It lies without the scope of this paper to discuss King's theory of safety-valve construction, but as his division into four series is based upon the degree of perfection of valvular closure, a word of explanation is necessary. King's idea is very clearly expressed in his diagram.

"Diagram 1 represents a section of the right ventricle, and is intended to illustrate the gradual change of position incident to the columns of distention in a succession of animals.

A. The *solid wall*.
B. The *yielding wall*.
C. The *fixed curtain* and its *cords* (one instead of many).
D. The *curtain* and *cords* of *distention*.
F. The *moderator band* (of distention).
f. The transverse dotted lines explain the gradual disappearance (the fading transitions) of the same *band*.

"The numerals refer to the various attachments peculiar to the *columns of distention* in the several orders of animals.

"In relation to the *moderator band*, the *columns of distention* (represented in each case as one) are attached internally towards the *solid wall*, as seen at 1; or they are attached externally towards the *yielding wall*, as shewn at 4; or their attachment is intermediate, as at 2 and 3, between the two walls and upon the *moderator band* itself, though also extending farther, to be attached to either wall.

"Diagrams 2, 3, 4 and 5 may serve to portray the four earliest stages in which the *column of distention* is found, as described in the first series of animals.

"In Diagram 2, the *column* (*D*) is small, most dependent on the *solid wall* (A); most remote from the *yielding wall* (B); and almost destitute of a *moderator band* (*F*). In the remaining three, there is seen a gradual increase of the column and band, and a greater inclination towards the yielding wall."

When the papillary muscles are situated at 1 or 2 (Diag. 1), no degree of dilatation of the ventricle can affect the closure of the valve, because the fibrous ring (at the angles *BD* and *AC*) remains constant as well as the position of 1 and 2. When the papillary muscles are at 3 or 4, however, it is evident that even slight dilatation will affect the closure of the valve, unless there is a compensatory lengthening of the papillary muscles in question. King's idea is that the trabecula supraventricularis (moderator band) will act as a check to dilatation, and keep the relative position of 3 and 4 constant.

"There exists, in the several orders, a *moderator band*, or cylindrical cord, of greater or less importance, traversing the cavity of the right ventricle, from near the center of the *septum* to the opposite point of the *yielding wall*. This *band*, which is generally considerable, seems of some use, as I have already explained, to moderate the degree of healthy dilatation; and it is found to be mainly connected with the *columns of distention*, which are attached about either of its extremities, or intermediately, as the case may be. The *curtains of distention*, by means of their *cords* and *columns*, are attached, in one case, to the left extremity of the *moderator band*, and into the *solid wall;* in a second case, they are secured to the middle part of the *band*, between the two walls; and in a third case, their attachments are into the *yielding wall*, at or near the yielding end of the *moderator band* (Diagr. 1).

"It will be evident that, in proportion as the *columns of distention* are attached close to the *solid wall*, they must be the less influenced by the yielding of the outer wall; and, on the contrary, it must be sufficiently apparent that the more the *columns of distention* are secured away from the *solid wall*, and near to the *yielding wall*, so much the more is the influence of distention left to operate freely in displacing the valves, and producing reflux.

"First, then, in certain instances it is found that the *curtain of distention*, or all that portion of the valve attached to the outer edge of the right auriculo-ventricular foramen, is secured by numerous cords attached about its floating edge; and that these cords are collected into the summits of two or more muscular columns, which are inserted into the *solid wall*, and therefore totally unaffected by any displacement of the outer wall. (See Diagr. 1, Column 1.)

"In the second place, or stage of progressive development, we may suppose the *columns of distention* inserted into the transverse *moderator band*, near the *solid wall;* in which case they

can be but slightly affected by the movements of the *yielding wall.* (See Diagr. 1, Column 2.)

"Thirdly, the *columns* are inserted into the same band, at a greater distance from the *solid wall;* and consequently more subject to the influence of distention; which, acting on the *yielding wall*, extends the *moderator band*, and carries out the *apparatus of distention.* (See Diagr. 1, Col. 3.)

"Lastly, the *columns of distention* are inserted into the *yielding wall*, at or beyond the corresponding attachment of the *moderator band;* in which case the results of distention are still more considerable. (See Diagr. 1, Col. 4.)

"The healthy dilatation of the right ventricle must of course result from the limited strength of the *yielding wall;* and it is necessary here to remark that the thickness of this part (most fairly estimated by comparison with the left) seems to vary considerably, both in quadrupeds and birds.

"Other elements of an imperfect safety-valve, which have been distinguished in the human heart, are also found to perform their part in the general animal series; namely, the form of the columns, the proportional extent of curtain, and the yielding nature of the auriculo-ventricular foramen, whose resistance, in all probability, is in equal proportion to that of the *yielding wall.*

"First Series.—I have said that the *columns of distention* may be inserted into the *solid wall*, more or less remote from the *moderator band*, whose office here appears to be of little consequence; and the band is therefore slight, or it merges almost imperceptibly into the union of the two walls anteriorly. . . . .

"This arrangement I have found to belong to most rodent, canine, and marsupial animals, and likewise to some others allied to them; but even this varied so gradually as to present a succession of stages, inclining to the more distinct form of a safety-valve adjustment."

(Here follows the description of the right ventricle of the hare, with a drawing.)

"In the hearts of this series, the *columns of distention* are usually more than two, and often as many as four, in number; and they increase in size from behind forwards, the posterior being comparatively insignificant. It is the anterior, or larger one, whose variations are chiefly remarkable. (Foot-note.—A still more anterior attachment of one cord can scarcely be considered a column.)

"The valve here, and in many hearts of the succeeding series, will not strictly admit the application of the term 'tricuspid,' since there is a little cuspid process, or curtain, between each two adjoining columns. The anterior column appears, in this series, to increase in size, nearly in the same ratio as the remainder decrease in number and importance. Its precise relative dimensions, together with the nature of its connection to the *moderator band*, are all the particulars here requiring attention.

"It will be seen, that in the hare all the *columns of distention* are planted on the *solid wall;* but it is necessary particularly to observe the attachment of the *anterior column* distinctly above the thin *moderator band.* (See Diagr. 3.)

"Now, in some other animals the *moderator band* is still less in size, and still more remote; until, perhaps, it altogether disappears. (See Diagr. 2.) But, on the other hand, tracing the series in the opposite direction, we see the *moderator band* rising to be inserted into the base (as at *F*) and even above the base of the *anterior column of distention* (as at *f*). (See Diagr. 4.)

"And, still farther on in the succession of gradations, the *moderator band* (or rather cord) has an insertion low down in the body of the *column*, and subsequently into the *solid wall* (see Diagr. 5); at the same time, we may perceive that the *column* is much increased in extent, which must give it a material influence over the *curtain of distention*, during its contraction.

"In classing the animals after their several proportions of safety-valve construction, the following is the order in which I should arrange this first series, including only the animals whose hearts I have been able to examine at least once, and for the most part oftener.

"In the rat the columns of distention are three or four; and the *moderator band* is a mere film, and very remote.

"In the rabbit the parts are the same; but perhaps the rudimentary *band* is proportionally somewhat more distinct.

"Next in order is the hare, as already described.

"Then follow together the kangaroo, the little bush kangaroo, and the opossum (*Didelphys vulpina*), all of which have apparently three *columns of distention;* and of these the anterior has an increased relative size, at least in the two first animals. Their *moderator band* is a cord inserted into the very base of the *column*, and is double at its external attachment.

"The bear has a construction like the preceding. Its *columns* are three or four, and the *anterior* is larger. The *moderator band* is a slight cord, divided externally, but inserted into the column immediately above its base. (See Diagr. 4, *f.*)

"The dog's heart is very little in advance of the last in the scale; and that of the fox is probably even less so. In an Australian dog, I found the *anterior column* divided at its base into two equal insertions; one of which was on the *yielding wall*, and was peculiarly remarkable for the traction which had manifestly been exerted upon it by an old and partial pericarditic adhesion at this point. (Foot-note.—A patch of pericarditic thickening on this spot is found in a majority of human adult hearts: it seems to be a part peculiarly liable to distention and attrition.) In another dog (a Spaniel) the second *column* was found bifurcated, and attached in a similar manner. Both these circumstances are probably very unusual."

King places in this series the following animals in the order given: Squirrel, guinea-pig, porcupine, mole, stoat, ichneumon and hedgehog. He states that in regard to these, as well as to the succeeding series, many gradations must be supplied.

Of this series I have examined the rat and the dog. In the one rat heart which I examined, there were three papillary muscles, the anterior very large and the two posterior of equal size, situated on the septal wall, but comparatively high up. The position of the papillary muscles alone justifies its place, as near the first of the series. The right branch of the conductive system was very marked, being a delicate, translucent strand, of about 0.5 mm. thickness, and passing over the crista supraventricularis to the base of the anterior papillary muscle, and then running back towards the posterior. This appearance of the branches and end-ramifications of the conductive system is quite characteristic of fresh hearts of this series and the following two. In the fourth series, which contains the hearts which have the most readily demonstrable Purkinje fibers, these delicate strands are accompanied on both sides by rows of fat cells. These give the net-work a grayish appearance. On closer examination, one can easily see the translucent strands, looking somewhat like blood-vessels, embedded in the fatty network. This translucency disappears in hearts that have been placed in the usual fixatives. It is probably due to the lack of the pigment, found in the cardiac musculature, and a large amount of clear sarcoplasm.

In the heart of the dog we have usually three papillary muscles, all situated on the septal wall, somewhat lower down towards the apex than is the case in the rat. The anterior is the largest and the posterior the smallest. When this last is failing, we have two or three smaller muscles, so small in some

cases that the tendons seem to arise from the septal wall itself. It is true that the term tricuspid does not properly apply to the valve. There is a large cusp on the outer wall and a smaller one on the septal wall. Anteriorly and posteriorly, these are connected to each other by smaller cusps (about 1 cm. attachment), but these may generally be considered as belonging to the valve of the outer wall. In all the hearts that I have examined, human, dog, rat and pig, there is, about 1 cm. to the back of, and superior to, the upper portion of the crista supraventricularis, a very small papillary muscle; or the tendons, three or four in number, arise from the wall itself. These tendons attach to the cusp which is also supplied by the large anterior papillary muscle.

The conductive system in this case passes along the crista supraventricularis, recognizable by a slight elevation, and after reaching a point opposite to the base of the anterior papillary muscle, runs backward and parallel to the annulus fibrosus, sometimes bridging across the depression between the anterior and middle papillary muscles in the form of a trabecula 1 mm. in thickness.

In one case I have found two papillary muscles, the anterior very large and double, situated on the outer, and one of fair size posteriorly on the septal wall. The appearance of the right ventricle was much like that of the pig's heart. The crista was replaced by the trabecula supraventricularis, as would be expected. This is a very rare anomaly in the dog's heart. The valves of the heart tore upon removal of the blood clot, and it could not be established whether the arrangement in this case was the truly tricuspid form, as is the case in the pig. The left ventricle did not differ from other dogs' hearts.

"SECOND SERIES (King).—In the hearts of a second series of animals, the *anterior column of distention* is of full size, reaching to the extremity of the *yielding wall;* and the *moderator band* is considerably developed, particularly in the most advanced grades; and in some we see, moreover, the *second column of distention* following the same course of development. (See Diagr. 6.)

"The appearance of a *moderator band*, in relation with its *second column*, rarely seems to become very significant, or deserving of attention. A third *column* is usually found, but it is of small size: thus the curtains are more liable to displacement, by reason of the extent of the *columns*, and their insertion occasionally into the *yielding wall*, together with their increased freedom from the *solid wall*, through their connection with the *moderator band*. . . . .

"The feline animals seem to be the first in this series. The cat has one considerable *column of distention*, based near the *yielding wall*, and traversed by the *moderator band*, which adheres to it, and confines it within a short range of the *solid wall*. (As Column 2, Diagr. 1.) In the same animal, I have seen the *second column* also inclining to this disposition. The valve of the gennet cat strictly resembles that of our domestic animal. In the yaguarundi, the *anterior column* is perhaps still more confined. The burrowing marsupial wombat seems to be analogous to these last, rather than to the kangaroos, as relates to its safety-valve.

"The ocelot offers one increased degree of enlargement of the *moderator band*, and freedom of the *anterior column*, without any other visible alteration.

"The leopard has the *anterior column* still more free; and the *second column* is lengthened, and a good deal more free than the corresponding pillar in the preceding animals, as if loosening itself from the solid wall. (See Columns 1 and 2, Diagr. 6.)

"The lemur probably belongs to this series. Its *first column* has, however, less freedom even than that of the cat, the *moderator band* being, externally, very slight, but the *second column* is considerable, and seems almost exclusively to belong to the yielding wall."

Two hearts of this series came under my observation, one of an adult cat, and one of a new-born kitten. In the adult there was one large papillary muscle, that was double and situated, as King says, "based near the yielding wall." The second and third papillary muscles, the latter very small, were situated, however, on the septal wall. There was a very thin trabecula supraventricularis, but this continued in back of (that is, toward the septum) the large anterior papillary muscle to the middle one. This marks a different stage from that of the dog, that is, the tendency of the papillary muscle is towards the outer wall.

I admit that is not safe to judge from one specimen, but the new-born kitten that I examined had three papillary muscles, the two anterior of equal size, the posterior very small, and all situated on the septal wall. Macroscopically, I could not trace the conductive system further than the anterior muscle. If this is the usual condition in the embryo cat, then we should have here, ontogenetically, what King has demonstrated so well in a phylogenetic series.

"THIRD SERIES (King).—In pursuing these gradations of valvular development from the last named, that of the lemur, we should perhaps rank next all the genera of quadrumana; but the varieties which their tricuspid valves present are too considerable to admit of decided arrangement in this place. Some may probably require to be classed amidst the preceding series; and others may claim a place (according to the amount of their safety-valve action) even beyond that of the human; which, for the present, is placed immediately after them, man and the quadrumana forming a distinct third series. (As represented by the column 3, Diagr. 1.)

"After studying the structure in many quadrumana, I find it impossible at present to distinguish, in a satisfactory manner, the differences which it assumes in them. The thickness and capacity of their right ventricle differ much. The *moderator band* is visibly and progressively coming forward. The *columns of distention* are about three in number; but the two anterior of them only are considerable, and more or less inclined to the *yielding wall*. The variations which the *columns* present in different genera, and perhaps even in different species, with regard to length, size, and freedom from the solid wall, form a little set of transitions of considerable interest for future inquiry.

"The parts in the orang satyrus (*Simia s.*) may serve, perhaps, as a specimen of the medium characteristics of the valve in these varied tribes of animals.

"The tricuspid valve of the chimpansee is rather more like the structure in man; and, if we may judge from the extent of its *anterior column of distention* and *moderator band*, it will be found to possess a degree of safety-valve action exceeding that of the human heart.

Both these simiae have their right ventricles capacious and thin; but that of the last appears strong.

"The next gradation, in an advancing series, would probably be occupied by the human valve. . . . . The anterior or *first column of distention*, with its *moderator band*, may be regarded as a constant formation.

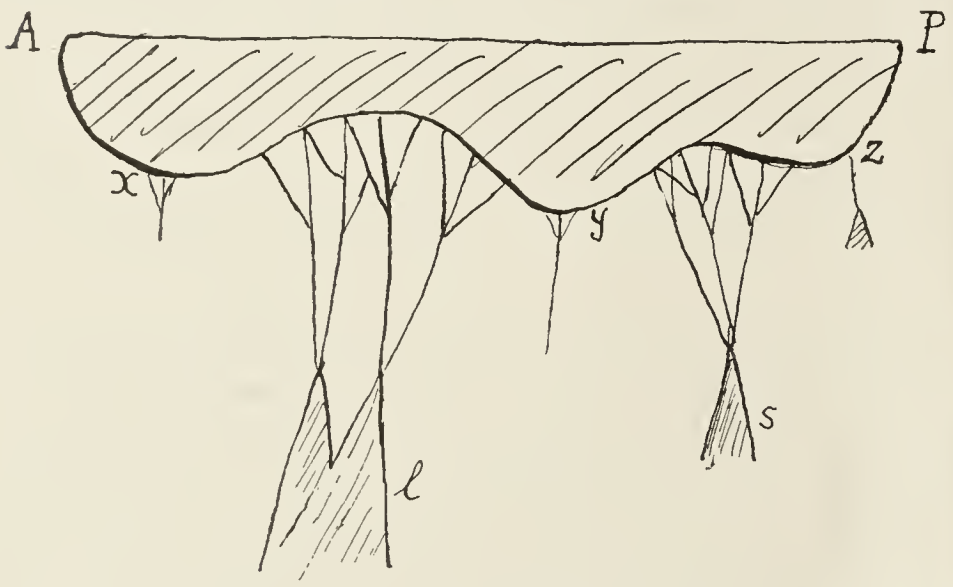
"A *second column* exists almost as uniformly, and often a third; but these columns of distention vary a good deal in size and arrangement. Frequently, the *first column of distention* is distinctly double; and sometimes there is a second *moderator band.*

"The length of the *columns of distention* is probably of very considerable importance. The *first* or larger column, in particular, sometimes reaches actually into the apex of the ventricle (see *D*, Diagr. 4). . . . .

"At this point I am again desirous to call attention to the fact, which I formerly more fully exposed, that the human heart, subsequent to birth, follows the gradations hitherto described. The gradual wasting (so to speak) and dilatation of the right ventricle slowly withdraw the *columns of distention* from the vicinity of the *solid wall.*"

I have been unable to find any reference to the allusion in the last paragraph, either in this paper or in the previous volume (Vol. I) of the Guy's Hospital Reports.

Of this series only the human heart was at my disposal. To establish the norm in this case is exceedingly difficult. The anterior papillary muscle is very large and controls practically the whole of the free cusp. There is usually a second, small



papillary muscle, which is situated midway between the anterior column and the posterior angle of the ventricle. These papillary muscles arise as independent projections from the dense network of columnæ and trabeculæ carneæ, which fills up the lower (apical) portion of the ventricle, sometimes being placed nearer the septal wall, sometimes high upon the outer wall. The large papillary muscle is quite frequently double, and even triple, and in these cases the posterior usually becomes more insignificant.

The tricuspid leaflets are generally four in number, next in frequency two, and more rarely three. When looking down from the atrium upon the atrio-ventricular opening, we can see the short line of attachment of the septal cusp, and a large crescentic line forming the attachment of the rest (external portion) of the valve. This crescent is usually without a break, and cuspid divisions are not seen. Upon cutting open the ventricle, the division of the cusps can clearly be differentiated, but not as is usually pictured in the text-books. The condition is diagrammatically represented in the figure above.

At *A* the external portion of the fibrous ring *AP* passes into the septal portion anteriorly, and at *P* it passes into it posteriorly. Near *A* the tendons arise directly out of the septal wall, while near *P* the tendons arise from a papillary muscle. These are frequently absent. The papillary muscles *l* and *s* are situated opposite the indentations of the valve and send the strongest and largest number of tendons to these. At *x* and *y*, tendons, very thin and long, that arise from the septal wall itself may be attached. The cusps, therefore, are situated between the main insertions of the tendons of the papillary muscles, and in the human heart there are usually three of these, composing the external leaflet. When the cusps are not so marked, we have two, and in this case *z* is the one to disappear.

The trabecula supraventricularis usually does not exist in the human or dog's heart, but in its place we have the crista supraventricularis (*BNA*). This crista is probably better marked in the human heart than in any other. We have but to consider the crista undermined in its lower portion, and a trabecula will result. It marks the division between the ventricle and the conus arteriosus; hence, its name. Not infrequently the right branch of the conductive system, which always passes along the edge of the crista or trabecula supraventricularis, beneath the endocardium, or sometimes beneath a layer of myocardium, continues on to the small posterior papillary muscle as a thin strand, formerly called a "false" tendon. So we see that here again King's descriptions are absolutely correct. In those cases, however, when the large muscle has shifted to the outer wall, then we find not a crista but a trabecula supraventricularis.

"Fourth Series (King).—(See Column 4, Diagr. 1.) A fourth series of animals is found, in which a valve of a truly tricuspid form is commonly seen; and in which, for the most part, one large *column of distention* is implanted into the outer wall, and generally with a long and free *moderator band.* But all these parts, in the fourth series, are subject to considerable progressive changes. The *curtains*, which, in their simplest form, begin to resemble the crescents of birds, may, on the one hand, shew a tendency to the bicuspid form; or, on the other, the number of divisions may be found increasing.

"The *column of distention* may be of good length, or short; and in the extreme case, the *cords of distention*, from 6 to 12 in number, appear actually to have insertion into the *yielding wall* (being, as it were, sessile). In this case the *curtains* are uncontrolled by any proper muscle. It is not, I think, to be supposed, that here the *columns of distention* (as such) are diminishing in number or importance, but rather the contrary; for the single column is more properly the union of a number varying between two and six or seven; and this union cannot interfere with the direct outward traction of each one, since the column is now become a little wall, parallel to the inner surface of the *yielding wall*, and having the *cords* inserted into its upper edge. This edge consists of a little chain of nipples—the disunited summits of two or more columns, each drawing outwards in nearly an equal degree.

"The most remarkable form of a *moderator band* is that in which this part is inserted close before the base of the *compound column of distention*, the opposite attachment being beneath the most anterior of the *fixed cords* on the *solid wall.* In this case, the *band* is muscular and cylindrical, but long and slight. It is very yielding, and seems to possess a peculiar elasticity. It is already declining in efficiency. It is evident that it can least

control the most posterior parts of the column of distention. In the transition through which the band may be traced in this series of animals, it either gradually wastes, or slowly removes itself; and becomes more short and muscular, until it is nearly lost in the anterior and inferior junction of the two walls. Now here, where the simple effect of distention is greatest, the moderator band is ceasing to have any distinct office; and thus we found it circumstanced in the first gradations, where the *columns of distention* were immovable, and the *moderator band* a mere thread.

"I have taken the sheep and goat as typical of the present series. The column of distention has, perhaps, a greater proportional development, as to width, in the first, the *cords*, as well as the original number of *pillars* (now united), being increased, and also, as I presume, the liability to valvular displacement. The gazelle resembles the goat; but its *moderator band* is manifestly leaving the *column of distention*. With it are the harnessed antelope and the axis-deer, according to my specimens. The reindeer possesses the compound *columns of distention* in the greatest development, in breadth as well as in the number of cords and muscular points or nipples; but its moderator band has its insertion still more inferiorly than in the gazelle.

"The ox has for a *column of distention* a short kind of mastoid process, over which the cords have scattered insertions; and both the horse and ass (I have found the proportion very similar in two zebra's hearts likewise) possess a little prominent *column*. In all these the *moderator band* is placed low, and very much as in the gazelle; and it is, for the most part, scarcely muscular, but long, slight, and yielding, and often almost disappearing, as it were by atrophy. Sometimes there are two thread-like cords only. On occasions, however, the *band* might appear to be of importance, being of great thickness and moderate length; but then it is placed farther distant from the *column;* and, as I have found it attended with an unusual degree of hypertrophy in the cavity, and elongation of the column, I regard it as a part of a congenital excess of power in this cavity altogether. Under all circumstances, it appears only as an exception.

"The valve of the pig much resembles that of the sheep; but the cords and points in the *compound column of distention*, as well as the *moderator band*, are somewhat less considerable. The cavity seems capable of much enlargement.

"The llama and camel present very interesting gradations. The first has a bifid *column of distention*, with pretty numerous *cords;* which seems to explain the opinion that the broad column is formed by the aggregation of several parallel pillars; as if a succession of single columns left the *solid wall*, posteriorly, to augment the breadth and traction of the *compound column* in several different degrees or gradations. Here, and in many of these animals, the most posterior of the *fixed cords* are beginning to have a distinct muscular column. In the llama, also, the *moderator band* is muscular and of good size, but very unfavorably placed to affect the *column of distention*: it is very near to the anterior union of the two walls. In length of its *column*, and the remoteness of its *moderator band*, the camel would appear to stand midway between the reindeer and the lama—at least, if I may judge from a single, and not a very favorable specimen. (Footnote.—The right ventricle of the giraffe possesses a valve of a very simple tricuspid form. The single *column of distention* is of little width, conical, and somewhat lengthened. Its cords seem few, and little scattered on the summit. The *moderator band*, long, and of inconsiderable thickness, is placed nearer the single column than in the llama and camel. One posterior fixed column is considerable.)

"According to its valvular formation, the seal requires a place among the fourth series of the mammalia. It has a *moderator band* of rather less efficiency than that of the llama, but its compound *column of distention* may be said to be triple. It is large, irregular, much divided, furnished with many cords, short, and based upon a thin cellular wall. The posterior *fixed cords* possess a considerably muscular column. The cavity admits of much extension. This animal has some slight tendency to a divison of the ventricles in the form of a bifid apex; and seems to be allied by this, as well as by its habits, to those warm-blooded and respiring aquatic animals, in whom the separation of the ventricles is more distinct, as in the porpoise, and still more in certain other cetacea."

Of this series I have examined the pig and sheep. In the latter the anterior papillary muscle is indeed very flat, and from it arise from 8 to 12 tendons. There is a posterior papillary muscle, very short and arising with a broad base high up on the septal wall. The tendons arising from this muscle, 4 or 5 in number, attach to both the septal and the outer leaflet. The valve is truly tricuspid, showing distinctly that the indentations are situated opposite the papillary muscles and the broad surfaces of the valves between them. The trabecula supraventricularis is well marked. In the pig, the conditions are very similar. The heart itself is not so conical in shape as is that of the sheep, and contains less fat in the epicardium and endocardium. The posterior papillary muscle is sometimes double, and in this case the more posterior portion furnishes the tendons for the outer leaflet.

Before we look into the development of the crista supraventricularis and papillary muscles, it is well to present the views of a few more authors. In his "Harveian Oration" Rolleston (6), '73, describes his discovery of the moderator band in the Australian cassowary (*Casuarius Australis*), which has a homologous position to that in the sheep. He also makes a good comparison in the appearance of the large papillary muscle, crossed by slender fibrous bands at right angles (the right branch of the conductive system) to the corpus callosum crossed by the striæ longitudinales. "This band of fibres can sometimes be traced up towards the conus arteriosus, and be seen not to die away until close upon the point of origin of the most anteriorly or upwardly placed chordæ tendineæ arising from the septum to pass the hindermost of the three segments of the tricuspid." And then he shows that these striæ are homologous to the "moderator band," which may "raise itself from the position of fusion" and "assume the character of a cylindrical band for a lesser distance."

Bands stretching across the ventricle have been known before King's time, as is shown by the description of Bell (7), '26. Cruveilhier (8) describes the trabecula supraventricularis, to which he fails to give a name, as being the line of division between the atrial and pulmonary orifice. Testut (9), '93, follows this same description. Poirier (10), '01, calls it "bandelette ansiforme," and besides making it the landmark of division between conus and ventricle, he ascribes to it the prevention of hyperdilatation. An extensive monograph by Sée (11), '74, makes this band analogous to the "demi-sphincter" which replaces the tricuspid valve in birds. This seems to be in agreement with Rolleston, but differs from King's opinion, who looks for "the rudiment of a moderator band among those little pillars which assist to connect the

two walls opposite to the crescent of distention anteriorly" (p. 164). Although the paper shows a great deal of anatomical work, and an examination of the hearts of dog, ox, horse and man, yet he fails to make any remark upon the position of the papillary muscle. This applies also to Brown (l. c.), who examined the hearts of edentata, ungulata, sirenia, cetacea, rodentia, carnivora and primates.

Recently Horand (12), '08, published a paper on the "*faisceau arqué,*" or "moderator band," which shows the results of the study of 120 human hearts. Horand divides it into three groups: (I) *Faisceau arqué libre,* (II) *Faisceau arqué partiellement libre* (classic type), (III) *Faisceau arqué complètement adhérent,* and bases all variations on the nearness of the insertion of the anterior papillary muscle. He quotes Testut that it is present in 70 to 80 per cent of cases. He also ascribes a "moderator action" to it.

Various authors, Turner (13 and 13a), '93, '96; Rolleston (14), '97; Huchard (15), '93; Browicz (16), '96; and Horand (17), '08, mention a "moderator band" in the left ventricle. This band is easily accounted for when we consider its function, namely, to conduct the impulses from the sinus or atrium to the ventricle in a given time. The left branch of the conductive system spreads out beneath the endocardium at an angle of about 30° from a point situated 0.5 to 1 cm. below the junction of the posterior and right semilunar valve to the two papillary muscles. When these are situated some distance from the septum, the conductive system will stretch across the ventricular cavity instead of reaching them by way of the septum and numerous large trabeculæ and columnæ carneæ at the base of the papillary muscles.

The further literature on "moderator bands" and intraventricular bands in general is not very extensive, and its contributors have been mostly clinicians, who saw in them an explanation for certain musical murmurs: (Huchard, l. c.; Browicz, l. c.; Rössle (18), '02; Galli (19), '04). It is not for me to discuss this side of the subject, but judging from a purely anatomical standpoint, I think it very unlikely, because most of the bands are not tense enough, especially during systole. The autopsy shows frequently other lesions, and we have but to call to mind that it takes but a very slight aortic insufficiency to produce a musical sound, to make us skeptical in the belief that these bands produce murmurs.

In connection with the pathology of the conductive system quite a discussion has arisen lately about the significance of these aberrant strands in the ventricles. Before the time of Tawara the general concensus of opinion was that all aberrant bands acted as moderator bands and contained sometimes connective tissue, sometimes ventricular musculature. Tawara (20), however, claimed that every aberrant tendon, in both the left and the right ventricle, was but a pathway or bridge for the ramifications of the conductive system. Mönckeberg (21 and 21a), '08, however, has come to the conclusion that these aberrant tendons (*sogenannte falsche Sehnenfaeden*) are of four kinds which are to be divided into two groups, each with two subdivisions.

A. Strands which have nothing to do with the atrio-ventricular bundle.
   1. Strands which contain no musculature (real aberrant tendons).
   2. Strands which contain ventricular musculature.

B. Strands which contain abnormally directed fibers of the left branch of the atrio-ventricular bundle.
   1. Strands which contain atrio-ventricular fibers exclusively.
   2. Strands which contain also ventricular musculature.

The group A belongs to the upper part of the septum, between the undivided branch of the left branch, and the anterior mitral cusp. To group B belong such tendons that leave the septum beneath the anterior portion of the septum membranaceum, or the anterior aortic cusp.

The question whether a trabecula contains branches of the conductive system can readily be decided, at least in the pig and dog, by employing the following method: A fresh heart is put into almost boiling water, and allowed to remain there until the tissue is thoroughly soaked and becomes hard. It is then put into an emulsion of carbolic acid and water. Almost immediately the subendocardial ramifications will stand out as white strands on a gray background. If the hearts are kept in this emulsion, which will gradually separate into two layers, for a month or more, the myocardium will turn dark brown, and the ramifications will appear very distinctly as gray strands on a dark background. This method has also a selective action for nerve fibers, for which it was used in a modified form by Shuk (22). The hearts will not stand long exposure to air, and I am at present trying to bring the hearts into a solution that is not so disagreeable to handle as carbolic acid is. I have no explanation to offer for this phenomenon. It may be that the nerve fibers which always accompany the sino-ventricular bundle[1] take on the same appearance in the endocardium as they do in the epicardium.

With this method, it is evident that, in the pig, so-called false tendons are always bridges for the conductive system. By conductive system I mean not only the sino-ventricular bundle, but also the accompanying nerve fibers. It is easy to trace the delicate ramifications; in the right ventricle a hand lens is necessary, and one can see that some of the branches high up on the septum are really a part of the end-ramifications and not branches which come off directly from the main branch. In the human heart the sino-ventricular bundle is so poorly differentiated that it is no wonder that Mönckeberg did not recognize the bundle, especially where he was dealing with the recurrent branches.

[1] As the development shows that the bundle arises from the sinus and not from the atrium, I have suggested the name sino-ventricular instead of atrio-ventricular bundle. The sinus in the adult comprises the greater part of the right atrium; namely, the whole region between the venæ cavæ posteriorly, and inferiorly, the limbus fossae ovalis on the left and superiorly, and the valves of the inferior vena cava and coronary artery near the ventricular orifice. (Retzer (23), '08.)

We have now considered the structure and position of the papillary muscles of the right ventricle and the relation that the right branch of the sino-ventricular bundle bears to them in the adult. The study of the embryonic conditions will help to bridge over some of the gaps, and give us a clearer understanding of the causes underlying the structure. My study is based on the pig embryo. In the heart of an embryo of 5.5 mm. the musculature of the ventricles forms a spongy network with wide meshes. The outer wall consists of a two-cell layer of poorly differentiated musculature and at this stage the endocardium has become adherent. At 6.5 mm. there is an enormous increase in the trabecular network, with a decrease in the size of the meshes, and a thickening of the outer wall. The division between right and left ventricles is well marked externally by the sulci longitudinales and interiorly by the more compact trabeculæ which give rise to the septum ventriculorum. At 20 mm., although the foramen interventriculare is almost closed, there are free communications between the right and left ventricles through the wall of the septum itself, as injections into the ventricular cavity and subsequent corrosions will show. There are no large cavities to the ventricles until later, when the approximation and consolidation of the trabeculæ take place. A portion of these trabeculæ remain prominent and project into the ventricular cavity. These become the papillary muscles and trabeculæ carneæ. In the case where there is a trabecula supraventricularis this develops in the same manner.

The thickness of the walls of the right and left ventricles is about the same in the embryo, but the right ventricular cavity is considerably smaller. The conus arteriosus is very large and remains larger than the right ventricle until birth, when the increased activity of the ventricle and the diminished activity of the conus cause a reversal of this condition. The conus of the early embryo is not free of trabeculæ, but these soon flatten out against the wall and at birth remain as columnæ carneæ. The position of the papillary muscle remains the same in the embryo as it does in the adult. There is no shifting from the mesial (septal) to the outer wall. This is very important, for it at once dispels the idea that it is secondary and due to increased pulmonary pressure, as King suggests.

King's observations, which have been verified independently by my own, form an interesting contribution to the comparative anatomy of the right ventricle. I fail to find an explanation why the human heart (Series III) should stand between the dog's (Series I) and pig's (Series IV), but no doubt there is some physiological reason. It cannot lie in the habits of the animals. Hand in hand with these differences in gross structure and relations go changes in the histological appearance of the conductive system. The Purkinje fibers were discovered in Series IV, and their presence in Series I and II was denied for many years.

If we consider the crista or trabecula supraventricularis as the dividing line between the right atrium and conus, and our embryological studies bear this out, it seems that the hearts of Series I have a larger conus than those of Series IV, and II and III lie intermediately. There are frequent exceptions to this rule, but always when there is an unusual number of columnæ carneæ. The smoother the internal surface the larger the conus, a fact which may be due to the greater strength in those hearts with columnæ. There are certain of these columnæ in Series I and II which stand out very prominently, and are either absent or poorly developed in the adult III and IV, although well marked in the embryo of the latter series. Importance is attached to them by some physiologists.

When we consider the presence or absence of the valvula venæ cavæ inferioris (Eustachii) or the position of the semilunar valves (which probably indicates the size of the constrictors of the aorta and pulmonary aorta), the series fail us.

It seems unlikely that hypertrophy of the right ventricle can affect the position of the papillary museles, as some authors claim; but it seems logical to suppose that the valve of Series I is more efficient than that of III and IV. It is well for the experimentalist to take this into consideration and not deduce conclusions for the human heart when the observations have been made on the dog's.

This study has been entirely upon the right ventricle, and adds but a small contribution to our knowledge of the intricate structure of the heart. The variations here are as great as they are in any portion of the vascular system, and it takes time and an abundance of material to establish a norm. Until this has been done, we can but poorly appreciate the many changes brought on by extraneous influences.

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THE EFFECT OF SCARLET RED, IN VARIOUS COMBINATIONS, UPON THE EPITHELIATION OF GRANULATING SURFACES.

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This paper has as its basis the observations made during the treatment of 60 cases with scarlet red.

Chemical Structure.—Scarlet red, or Biebrichs scarlet red, was discovered in 1882, and is an anilin dye which stains silk and wool a brilliant scarlet color. It is a disulphonic acid derivative, and the dye on the market is the sodium salt of the staining acid, and is in the form of a powder. It is made from diazoazobenzoldisulphonic acid, and β naphthol, and has the formula:

$$C_6H_4(SO_3Na) - N = N - C_6H_3(SO_3Na) - N = N - C_{10}H_6OH(\beta).$$

Experimental Use of Scarlet Red.—Fischer of Bonn, in his paper on "Experimental Generation of Atypical Epithelial Proliferations," etc., published in 1906, called attention to the fact that when a saturated solution of scarlet red in olive oil was injected subcutaneously, an inflammatory condition was produced, and there was also an increase of mitosis in the germinal layer of the skin, as well as in the hair follicles and skin glands.

He was able to produce this proliferation in the skin only, and from this was led to believe that scarlet red acted as a specific attraxin upon the surface epithelium. He found that the new formation of epithelium caused by the injection of scarlet red oil, which very markedly resembled skin carcinoma, showed no tendency for independent aftergrowth, and kept up only as long as the injections were made. When these were discontinued the new formation retrograded and degenerated into epithelial pearly bodies. This suggested to him that it might be used therapeutically.

Helmholz, in 1907, was able to produce similar epithelial proliferations in the skin, and in addition succeeded in creating a like growth in the mouth and rectum. He thought that with the technic as finally developed, he could get the same results in the stomach, intestines, etc.

The positive results in the mucous membranes of the mouth and rectum would rule out the idea of Jores that the presence of hair follicles was necessary.

Helmholz found that there must be close contact between the scarlet red oil and the epithelium, in order that any reaction take place. He believed that scarlet red could hardly be claimed as a specific attraxin, but rather something that by interaction with the connective tissue produced a soil that was ready for epithelial development. He also showed that the cylindrical epithelium in these experimental tumors remained so only as long as it lined a lumen, and when it formed in masses it changed to the squamous type, and just as readily returned to the cylindrical type when lumina formed in the epithelial masses. This metaplasia showed how different the process was from carcinoma, in which the character of the cells remains constant.

Werner, in 1908, found that concentrated scarlet red oil, injected into carcinomata of mice, stimulated the growth only while the injections were continued, and from his experiments came to the conclusion that the proliferation was not due to a chemotactic influence on the cells, but occurred through the imitation of the same.

The above brief mention of the action of scarlet red oil, when injected subcutaneously, will give an idea of the theories brought forth as to the cause of the epithelial proliferations. I shall not discuss their relative merits here, but will simply take up the clinical results obtained by the local application of scarlet red, in various combinations, on granulating wounds, in order to hasten epitheliation.

From the experimental work mentioned above, and from the results of the therapeutic action so far reported, it seemed perfectly safe to use scarlet red externally for therapeutic purposes, without danger of producing carcinoma. My own investigations have, so far, confirmed me in this belief.

The only literature on the therapeutic use of scarlet red is as follows: Schmieden was the first to apply Fischer's sug-



FIG. 1.—Traumatic ulcers, 11 x 5 cm. and 5 x 2 cm. Age of patient, 76 years. Duration, 3 months. (*A*) Taken January 27, when treatment was begun. (*B*) Taken March 22.



FIG. 2.—Ulcer following operation for infection of forearm and wrist. Largest diameters 15 x 5 cm. (*A*) Taken January 27, when treatment was begun. (*B*) Taken January 29. The stimulation of the epithelial edges is well shown in this picture, and measures 4 mm.



FIG. 3.—Multiple specific ulcers on outer side of leg of negro. Duration over one year. Ulcers, 4 x 2 cm., 6 x 4 cm., 8 x 3 cm. (*A*) Taken November 25, 1908, when treatment was begun. (*B*) Taken December 9. (*C*) Taken February 4, 1909. Note return of pigmentation in newly formed skin (*C*).



FIG. 4.—Varicose ulcer, 15 x 9 cm. Duration several months. (*A*) Taken October 16, 1908, when treatment was begun. (*B*) Taken November 18. (*C*) Taken December 18. (*D*) Taken January 2, 1909. (*E*) Taken February 10. *A* to *C* show the stimulation of the lower left hand portion of the skin edge. Note return of pigment in new pink skin in *E*.



FIG. 5.—Ulcer following excision of epithelioma, 6 x 5.5 cm. Bone exposed. (*A*) Taken January 11, when treatment was begun. (*B*) Taken March 17. Difficult to make out the edges of the scar.

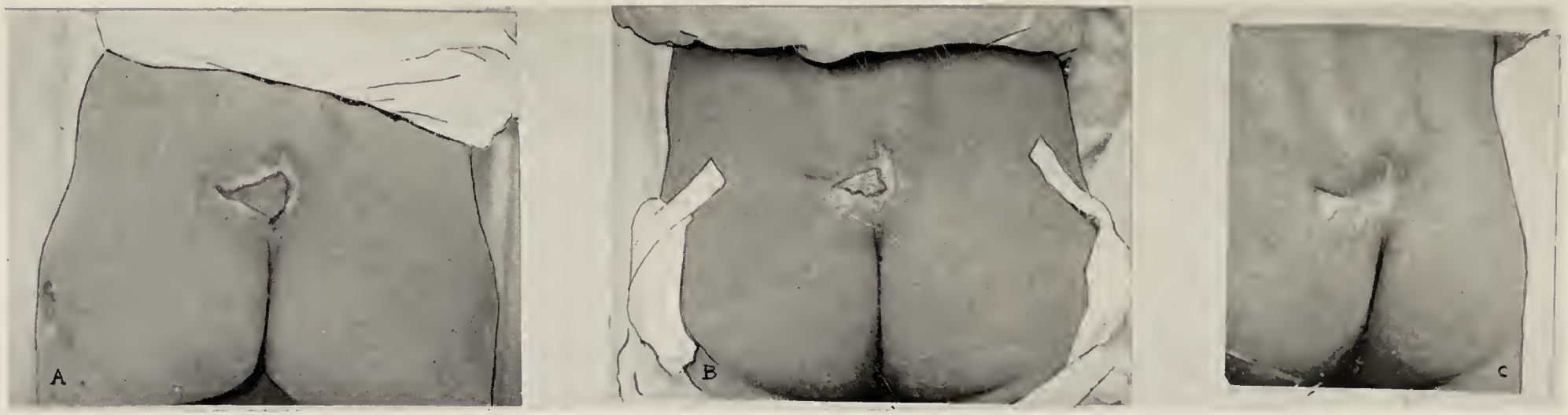


FIG. 6.—Bedsore following typhoid, 3 x 5 cm. Duration several months. (*A*) Taken November 6, when treatment was begun. (*B*) Taken November 18. (*C*) Taken December 7.



FIG. 7.—Ulcer following operation for infection, 9 x 3 cm. Duration, 1 month. (*A*) Taken December 30, 1908, when treatment was begun. (*B*) Taken January 8, 1909. (*C*) Taken January 15. Measure on final healing, 6.5 x 1.5 cm.



FIG. 8.—Ulcer following injury with subsequent deep infection. (*A*) Taken December 4, when treatment was begun. (*B*) Taken December 14.



FIG. 10.—A small portion of Fig. 13 under higher magnification. Note the papillary formation and the thickness of the stratum Malpighii. The masses of pigment cells in the deeper layers of the skin are interesting from the fact that the newly formed skin is pink and shows no pigmentation, while in certain portions of the section, where it passes through an isolated pigmented spot in the pink skin, there seems to be a definite relationship between the pigment in the deeper layers and that in the cells of the stratum Malpighii.



FIG. 9.—Section of negro skin, formed under Scarlet Red treatment, on a chronic varicose ulcer of the leg. The end (*A*) is 2 mm. from the growing epithelial edge. The end (*B*) is a portion of the normal surrounding skin and shows pigment in the deep layers of the stratum Malpighii. At (*B*) the papillary formation is not especially noticeable and the stratum corneum and Malpighii are about normal thickness. As we follow the surface toward (*A*), the papillary formation becomes more marked. All the layers of the epidermis become much thicker, and under high power intense cell division can be seen.

gestion, and published a paper on "Epithelial Growth under the Effect of Scarlet Red" early in 1908.

Kaehler, in May, 1908, and Krajea, in September of the same year, and also Cernezzi, in February, 1909, published enthusiastic articles on this subject, with modifications of Schmieden's technic.

Wolfrum and Cords, in February, 1909, reported favorable results on corneal ulcers with scarlet red salve.

Being stimulated by these papers, and having an opportunity to treat and observe a number of granulating wounds in the Surgical Out-Patient Department of the Johns Hopkins Hospital, I began a series of experiments with the scarlet red.

A few of the cases thus treated were house cases in the Johns Hopkins Hospital and at the Union Protestant Infirmary, but the greater number were those in the Out-Patient Department. These cases were not selected, and the wounds for the most part were very unsatisfactory to start with. Many were chronic ulcers of various varieties, belonging to the class of wounds upon which Schmieden stated the treatment with scarlet red was useless.

A large number of these patients continued their daily occupations, and thus the factors of rest and regular attendance could not be counted on. In fact, a more severe test of a treatment could scarcely be applied.

The dye employed was that manufactured by the Badische Company, of Ludwigshafen, Germany, which is sold in 1-pound cans, and is inexpensive.

In the experiments, I have used 2, 4, 5, 8, 10 and 20 per cent scarlet red ointments, with a simple vaseline base. As I have been unable to observe any antiseptic properties in scarlet red, I had the following antiseptic ointments of U. S. P. strength made up in vaseline, and containing 8 per cent scarlet red:—boric, zinc, iodoform, blue, and an ointment consisting of balsam of Peru, 1 drachm, to vaseline 1 ounce. On several occasions I have dusted small wounds with the pure powder.

The ointments were prepared by rubbing up the scarlet red with a small amount of olive or castor oil, until a smooth mass resulted, and then this mass was thoroughly mixed with the base.

Sterilization of the ointment caused the color to become somewhat darker, but this change did not seem to affect the stimulating power of the preparation.

Technic.—Clean, healthy granulations should be bathed with boric solution and dried. Should the granulations be unhealthy, peroxid of hydrogen is used in addition, before the boric solution. I have found it best not to use bichloride of mercury or other strong antiseptic solutions on the wound before treating it with the scarlet red. Free use of nitrate of silver stick is advisable to keep down exuberant granulations.

The skin surrounding the defect should be anointed with some bland ointment up to within 1 cm. of the edge. Since this has been done the irritation complained of in some of the early cases has been, to a large extent, eliminated.

The ointment may be applied over the whole surface of the wound if it be small, or simply to the growing epithelial edges. Whichever method is chosen it is best to apply the ointment on perforated old linen, to which the granulations will not adhere, and which allows the escape of secretions and thus prevents maceration. When applied to the edges, the old linen should be used in narrow strips covered with a thin layer of the ointment. I prefer the old linen to the rubber protective advocated by Cernezzi, as it is less macerating.

Another very satisfactory method is to apply a thin coating of the scarlet red ointment to the wound edges with a camel's hair brush, being sure that the edges are dry. Then either cover with strips of old linen, or expose to the air. This is especially useful in the partial graft cases, and on small wounds, as the ointment can thus be accurately placed, and the amount regulated.

The portions of the wound not covered by scarlet red may be dressed as seems best, or may simply be exposed to the air under a cage.

A light dressing of sterile gauze secured by a bandage completes the procedure. This dressing should be removed within 48 hours, 24-hour intervals being preferable, and replaced by some bland ointment, such as zinc or boric ointment. After the same interval has elapsed the scarlet red dressing should be replaced.

The importance of careful dressing is to be emphasized, as in some cases severe irritation has followed the improper application of the dressing.

It is well to warn patients that the ointment may stain the dressing red, as several have returned much frightened, saying that the wound had been bleeding.

Cases Treated.—There were 60 cases treated. Of these 44 were males and 16 females, the youngest being 2 years old, and the oldest 76 years. White, 46; colored, 14. Duration of the lesions, a few days to 15 years.

The cases were grouped as follows:

Partial skin grafts	7	cases.
Ulcer following operation for infection	10	"
Ulcer following burn	11	"
Traumatic ulcer	10	"
Specific ulcer	8	"
Varicose ulcer	7	"
Ulcer following Cotting operation for ingrown toe nail	3	"
Bedsore	2	"
Miscellaneous ulcer	2	"

The general health of the patient seems to have some bearing on the stimulating effect of the scarlet red, which is distinctly less marked in nephritic and diabetic cases. The age, on the other hand, has little or no effect; for instance the measured growth on one patient 76 years old was 3 mm. in 48 hours, and in another 67 years old, there was a growth of thick epithelium 4 mm. wide in 48 hours (Figs. 1 and 2). As we seldom have two lesions of exactly the same size on the same person, it is difficult to make an accurate comparison between the rapidity of healing of a wound treated with scarlet red and one treated with the ordinary methods. However, on one patient there was an ulcer 3.5 x 3 cm. on each

leg, and the one treated with scarlet red healed three weeks before the other, which was treated in the usual way. The difference in the appearance of the newly-healed area was very marked, that following the scarlet red being thick, firm, and so much like the normal skin that it was difficult to make out the original outline of the ulcer, while the usual sharply-defined scar marked the location of the other ulcer. In many cases there is undoubtedly a very marked stimulation of the epithelial growth, and while personal supervision in this series in connection with careful dressing is a factor which must be considered, taking the results as a whole, one would hardly feel justified in attributing the success of the treatment entirely to this supervision.

The rapid-growing epithelium is thick and at first a bluish-red with an opalescent spreading edge. Venules of considerable size can be seen close to the surface. The color and the enlarged vessels soon disappear, however, and the newly-formed tissue rapidly assumes the color and characteristics of the normal skin.

A section through an area thus healed shows practically normal skin. As a rule after a short time this skin becomes freely movable over the underlying tissues.

In several instances the patient did not return for from 5 to 16 days after dressing with scarlet red, and it was noted in two of these cases that where the granulations had been exuberant on small ulcers, a cone-shaped mass of epithelium covered these granulations. This projection soon disappeared, and the epithelium assumed the level of the surrounding skin. No apparent bad effect resulted from the prolonged exposure to scarlet red in these cases, except that a greyish membrane formed over the granulations, which could be stripped off, and the healthy granulations exposed. It is needless to say that there was no irritation in this group of cases. The greyish membrane over the portion of the granulations covered with scarlet red will often form within 48 hours, and can be easily lifted off.

The method of pigmentation of the newly-formed pink skin on negroes is interesting. Within a short time the sharply-defined edges of the normal skin become wavy, and streaks of pigment project from it (Fig. 3). Here and there in the pink skin isolated patches of pigment appear, some of which are several centimeters from the pigmented skin edge. This seems to show that the pigment is derived from the deeper tissues, as well as from the skin edge. The pigment spreads from these patches also, and the entire area becomes dusky, and later assumes the color of the neighboring skin.

The sensation of the newly-formed skin begins at the margins, and gradually spreads towards the centre. This is similar to what occurs in skin grafts, the nerve supply coming from the edges of the wound, and not from the underlying tissues.

On those wounds which heal and then break down, because of the unstable condition of the epithelium, scarlet red has been useful; for example, a superficial ulcer following a burn on the front of the ankle and entire dorsum of the foot, had nearly healed several times, and then completely broken down again. Treatment with scarlet red ointment was begun on December 26, 1908, and the healing was complete and all dressings were omitted on January 8, 1909, since which time the patient has had no further trouble, as the wound is covered with thick stable epithelium.

Scarlet red should not be used on burns until the irritation has disappeared, and the granulations are well established.

The exact strength and combination of the ointment to be used on different types of wounds can hardly be dogmatically stated, as experience is necessary for this knowledge. However, a few general observations may be of advantage. The 8 per cent ointment is used unless especially contraindicated. In some cases which were sluggish to the 8, the 20 per cent ointment has caused rapid stimulation of the edges. I should not advise the constant use of the 20 per cent strength, as on several occasions it has proved too irritating in spite of all precautions. It is of value now and then, although its action should be carefully watched.

On several wounds which were nearly closed, the pure scarlet red powder was dusted on the uncovered area, after protecting the surrounding skin. It had a marked drying effect and caused no irritation.

When the wounds are covered with unhealthy granulations, and the discharge is profuse and foul smelling, I have found the scarlet red in iodoform ointment, or balsam of Peru, or blue ointment very efficacious in cleaning up the granulations, and at the same time stimulating the epithelial growth.

As an example of the unfavorable type of wounds treated, I will mention an extensive multiple leg ulcer of five years' standing, which was covered with maggots when the rags with which it was wrapped were removed. This was cleaned up and dressed with scarlet red, and within 48 hours there was a definite stimulation of the epithelial edges, and uneventful healing later. It is interesting that this patient came to the Dispensary because he had mashed the tip of his little finger, and not for the leg condition, which he had been taking care of at home.

A number of large specific ulcers having a duration of from three months to five years, which had not responded to constitutional or local treatment, were stimulated markedly by scarlet red. Although they were among the most unfavorable looking ulcers, the healing was prompt and lasting. In the specific cases constitutional treatment was of course continued. Several of these ulcers were very sensitive, and the patients volunteered the statement when returning for dressing that the "red salve" gave them more comfort than any dressing they had ever had. This seems a curious fact, inasmuch as scarlet red had an irritating action on some other cases, and caused pain and discomfort. Scarlet red in blue ointment is especially useful in treating specific ulcers.

There is a difference in the degree of stimulation caused by scarlet red on the epithelial edges of the same wound at different times. I have also noted that in several cases one portion of the growing edge was markedly stimulated, while the remaining portions were only moderately so (Fig. 4).

The skin formed under scarlet red seems to fill the place of the missing skin, somewhat like a whole thickness graft, and in only one case has there been any tendency towards cicatricial contraction. This case, a burn of the neck and chest, was treated in the hospital by the usual methods for some time before scarlet red was started. Several weeks after healing the patient returned with a small contracted band of scar tissue on the left side of the neck. She was advised massage, and told to return if the condition continued.

Several varicose ulcers were treated with scarlet red without a pressure bandage, in order to test the efficacy of the healing, and there was no diminution noted in its rapidity or character.

Ulcers following the Cotting operation for ingrown toe nail are usually sluggish, and heal slowly, but with scarlet red the healing is materially hastened.

In an ulcer following the excision of an epithelioma of the face, there was a recurrence in the lower angle of the wound three weeks after operation. The ulcer had been treated once with scarlet red, only two days before the recurrence was noted, so I do not consider that the scarlet red was in any way responsible for the recurrence (Fig. 5).

I have been able to try the effect of scarlet red on autodermic and isodermic partial Thiersch and whole thickness grafts, and also on zoödermic (dog) grafts. All of the seven cases which were grafted had very extensive lesions, and several partial grafts were placed on each of these at different times. The wound edges and also the edges of all these types of grafts were markedly stimulated. Scarlet red, 8 per cent, if applied to the surface of a Thiersch graft within four days after transplantation, causes maceration of the surface. In order to avoid this I find it advisable to apply the scarlet red in from 4 to 8 per cent strength to the edges of the graft alone, and not until 10 days have elapsed. Only the edges of whole thickness grafts should be covered with scarlet red, unless the superficial layers are cast off, in which case the whole surface of the graft should be covered, as it will hasten the "topping" of the graft with epithelium.

Wolfrum and Cords report favorable results with 5 per cent scarlet red ointment on corneal ulcers.

My experience with scarlet red on mucous membranes has been confined to pieces of vaginal mucosa transplanted on to granulating wounds. The edges of these grafts were stimulated, and also the defect left by the removal of sections for examination healed under scarlet red very rapidly. From the above experience I have no doubt but that this method of treatment can be utilized with advantage on mucous membranes, which can be kept reasonably dry.

It is an interesting fact that the scarlet red is absorbed and then excreted by the kidneys. This has been noted in a number of cases: for example, a large ulcer of the chest, following a burn, was dressed with scarlet red, 8 per cent, at 1.30 p. m., December 13, 1908. The urine voided at 2.10 p. m. was clear amber; at the next voiding at 9.30 p. m. it was a bright scarlet. December 14, at 2 a. m., still a bright scarlet; at 8.10 a. m. it was a pale red; at 11.25 a. m. still a pale red; at 1.30 p. m. the scarlet red was removed and the wound was dressed and irrigated. At 2.15 p. m. the urine was a reddish amber; and so on until 8.30 a. m., December 15, when it was a pale pinkish color; after this the urine resumed its normal amber color. There is no undue stimulation of urinary secretion, and except for the color, the constituents of the urine are unchanged. The other excretions were apparently unaffected.

There was severe irritation in 10 cases, 8 of which were not permanently helped by the treatment, although there was stimulation of the epithelial growth in all but two cases. Most of these cases were those treated early in the series, and since better technic has been employed, no severe irritation has occurred. However, in 16 other cases there was a slight reddening of the surrounding skin accompanied by a burning sensation at some time during the treatment, although this in no way interfered with the ultimate result.

In several instances scarlet red had to be discontinued on account of the pain and irritation caused by it. This was especially noticeable in women and young children.

In the case of a child two years old, with an ulcer following a burn of the axilla, the irritation of 5 per cent scarlet red ointment was very marked. Following a second application of the ointment there was a sharp attack of erysipelas. Cultures from the ointment were negative, and as there had been no case of erysipelas in the hospital for some time it is likely that the irritation produced a favorable condition for the infection.

In a case of varicose ulcer of which the duration was 10 years, and where the skin was particularly sensitive to scarlet red, there was a definite phlebitis of several veins in the neighborhood of the ulcer, after the third dressing with scarlet red, and it seems probable that the irritation caused by the scarlet red might have extended into some of the superficial varicose veins. This patient became very ill, and was admitted to the hospital. He ran a high temperature for about 10 days, which was suspected to be due to typhoid infection, but this was not proved, and about three weeks later he was discharged from the hospital, the phlebitis having cleared up perfectly.

In a tuberculous ulcer of the groin of eight months' duration, measuring 8 x 10 cm., and having undermined edges, scarlet red was tried and very markedly stimulated the epithelial growth. It was quite remarkable that the new thick epithelium started beneath the undermined edges, and for a time these edges overlapped the new epithelium slightly, but were finally absorbed. This ulcer healed rapidly with firm healthy skin until 1.5 x 2.5 cm. remained uncovered, then suddenly without any apparent cause the ulceration began again here and there on the edges and in the new skin. On the continuance of the same treatment the ulcer finally healed completely, and as yet shows no tendency to break down.

Where tight pressure bandages are applied over scarlet red, there is more likelihood of irritation. There have been several cases in which there was marked stimulation of the epithelial edges at the beginning of the treatment, but later just as marked deterioration. This was the case especially when the

attendance of the patient was irregular, and in such instances the treatment with scarlet red was discontinued.

In one case where a patient with a varicose ulcer stayed away from the Dispensary for five days with the scarlet red dressing, the irritation of the surrounding skin was so intense that a break-down was feared. This fortunately did not occur.

The skin over old scar tissue is apparently much more easily irritated than normal skin.

The stability, thickness, and normal appearance of the healing under scarlet red is noteworthy, and even if the healing in some few instances is no more rapid than that under the ordinary methods, these advantages would seem to make it worth while (Figs. 6, 7, 8, 9, 10).

NOTES.—The effect of Soudan III on the epitheliation of granulating wounds is now being tried, and the results will be reported later.

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THE DISPOSAL OF THE WASTE OF THE BRAIN TISSUES.

By HENRY J. BERKLEY, M. D.,
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Unlike other organs of the body, the tissues of the encephalon are devoid of the ordinary system of lymphatics, using the word lymphatic in the same sense as we do in the emunctories of gland or muscle, and a newly-arranged apparatus now subserves these functions. Within the brain substance, one finds two varied apparatus that supplement each other, and serve to carry off the used-up products of cell metabolism, as well as the effete serum that has percolated through the walls of the capillaries into the surrounding tissues.

As stated, the system consists of two essential parts, which together form an unit. One division may be described as having a passive function, the spaces that surround the blood-vessels, both veins and arteries, hence are known as the peri- or extra-vascular spaces, or channels, which act as the collecting sewers for the general system; and secondly, an apparatus consisting of complicated neuroglia cells, with fleshy bodies, from which extend channeled feet into the periphery of the perivascular spaces acting as important collateral drains to the general sewage system.

A third though very subsidiary apparatus should be included in the general system, belonging to the sheaths of the blood-vessels and not to the nervous substance, and lying between the muscularis and adventitia of the vessels' walls,—the so-called Virchow-Robin lymph space. This carries effete plasma only from the elements of the blood-vessels' walls, and from nowhere else, and is of minor importance to the nerve tissues.

The active drainage apparatus, the footed or podasteroid cells, are found in myriads in the cephalic substance along the blood-vessels, as well as at more distant points. They are more clearly brought out, as well as differentiated, by the silver than by other stains. In a section of the cortex of the brain, so treated, they show a fleshy body, coarsely arborescent branchings, and a thicker foot attached within the margin of the perivascular space. These cells take up and pass on into the His lymph space substances, both fluid and solid, which are no longer of service to the tissue economy.

How do we know that this latter statement is true? Because after a cerebral hemorrhage these cells are found to be filled with the detritus of red-blood corpuscles; after a severe toxæmia, as for instance, following acute alcoholism or ricin poisoning, they are seen to be swollen and degenerating.

The function of the brain, as an organ of mind, is directly dependent upon their efficiency. If they lose their functional activity there is a consequent retention in the tissues of catabolic residue, a part of which, the altered albumens, must be exceedingly deleterious to the life of the nerve elements, and as a result of this imperfect metabolism we are unable to think clearly, or if the condition continues there is inhibition of the intellectual processes to their complete extinction.

The deeper lying podasteroid elements are assisted to some extent by certain other neuroglia elements having the same function. These are situated just beneath the peridyme of the brain rind, and have a wedge-shaped body with numerous thin hair-like extensions radiating centrally, very much like the brush of a horse's tail, and from this likeness are called the horse-tail cells. Toward the periphery they throw out shorter and thicker branches terminating in an end-knob lying on the free surface of the cortex, among the felted network of neuroglia fibres that at this place forms the outermost covering of the brain rind.

Through these clubbed feet the excreted lymph is thrown directly into the epicerebral space, to be carried off in a manner to be described later.

The part of the sewers, through which the lymph drains from the various tissues to eventually pass to the neck lym-

phatics, is subserved by the pericellular and perivascular spaces. In a section of the cortical substance—preferably from the brain of a new-born child—one may see, surrounding each pyramidal cell, a free space which extends up and down for some small distance on the stems of the apical and basal processes. The cell body is therefore separated and surrounded at all times by a fluid which, to an extent, isolates it from the adjacent tissues. By a careful search one may further determine that from each of the perivascular sacs a fine channel extends to the lymph space surrounding a neighboring blood-vessel, and that the contents of the sac may discharge into the perivascular space at any time, either by increased pressure from behind or by capillary attraction. Furthermore, it is possible, in early life, to inject these pericellular spaces with colored fluids from the perivascular space of one of the larger blood-vessels.

The pericellular sacs appear to be the end stations—the cloaca so to speak—of the perivascular canal apparatus, into which the devitalized serum as well as the waste tissue products directly drain from the larger nerve-cell bodies.

For the many smaller elements, nerve or neuroglia, as the case may be, the other apparatus—the channeled podasteroid glia elements—appears to suffice.

Let us turn back for a moment to consider the structure of the cerebral blood-vessels and their adnexa. On looking at a section of the cortex from a young child, and selecting one of the arteries of considerable size, it is immediately recognized that the arrangement of the vessel with reference to the adjacent tissues is different from that of any other portion of the body, and that the adventitia of the vessel is not in intimate contact with the surrounding tissues, but hangs freely in a space—the so-called lymph space of His, or perivascular space—which now affords a complete drainage apparatus for the lymph.

Internal to the adventitia another split or space is seen—the intra-adventitial or Virchow-Robin lymph space—which serves to carry off the used nutrient fluids from the middle sheath of the blood-vessel itself.

On further examining the section we will discover that the points of discharge of these lymph canals are quite different from those of the His space, the Virchow-Robin following the course of the blood-vessel into the vascular layer of the pia, and there discharging into the lymph lacunæ of this membrane, while with the perivascular channel the discharge is directly upon the epicerebral surface, to eventually find its way through the lymph splits of Arnold into the general system of lymphatics of the pial membrane.

After passing into the wide lacunæ of the soft covering of the cortex, which are very numerous, the lymph eventually finds its way through foramina at the base of the skull into the deep cervical lymphatics, thence into the lymphatics of the thorax.

In a very minor degree the meningo-ventricular serous cavities may also be considered as having some excretory function. From the almost completely closed character of these spaces in man, it must amount to very little, while in such an animal as amphioxus it may be very considerable, for in the latter instance water is taken up through the infundibular opening, passed through the equivalent of the ventricles, through the canal of the spinal cord, eventually out through the blastopore, carrying with it any effete substances. The sub-dural space is covered, like the ventricular surfaces, with flattened epithelial cells, and one communicates with the other through openings in the pia mater on the lower portion of the floor of the fourth ventricle.

To recapitulate: The main channels or excretory sewers of the brain substance are subserved by the His lymph spaces of the blood-vessels, which empty upon the peridyme of the cerebral cortex, and their beginning is in the sacs surrounding the larger nerve cells, particularly those of the second and third layer of the cortex. The function of this portion of the excretory system is mainly a passive one.

Adjunct to the actual sewers, we find an apparatus consisting of peculiar neuroglia cells with terminal channeled feet inserted into the perivascular space walls, into which it throws fluid or granular material from the breaking down of cellular elements—nerve or blood cells as the case may be—to eventually find its way through the common excretory sewer to the cortical surface. The function of these channeled neuroglia cells must be an active one, for the reason that after hemorrhages within the brain substance they are found filled with hematoidin granules from the disintegrating red-blood cells.

POST-ANÆSTHETIC ACIDOSIS.

By F. F. Gundrum, M. D.,
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General anæsthesia is occasionally followed by untoward effects many hours after the narcosis itself. Since the pioneer paper, by Casper (1), many authors have reported instances of serious and fatal post-anæsthetic intoxication, more commonly following chloroform, but observed also after ether (Guthrie (2), Brewer (3), Brackett, Stone and Low (4), Bevan and Favill (5), Carmichael and Beattie (6)). Ethyl-chloride, too, has given rise to a post-operative acidosis (Cunningham (7)). In the study of this condition, other investigators have made routine analyses of the urine of patients before and after anæsthesia, testing for acetone and diacetic acid as the indicators of an acidosis (Becker (8), Kelly (9), Hubbard (10)). It seems certain that after surgical anæsthesia one not infrequently meets with an acid intoxication,

as evidenced by the appearance of acetone, and less often of diacetic acid, in the urine. This intoxication may be so slight as to give rise to no clinical symptoms at all or may be so severe as to cause the speedy death of the individual. The moderate cases are recognizable clinically only by the somewhat prolonged post-anæsthetic nausea and vomiting. The severe cases, fortunately rare, present the following symptom-complex. The patient recovers from the anæsthetic quite normally, and seems to be doing well for from 18 to 72 hours. Then nausea and vomiting set in, followed by great prostration, rapid pulse and drowsiness. The breath has a fruity odor and acetone and diacetic acid in large amounts are found in the urine. There is usually no fever. The stupor is interrupted by an active delirium, which is in turn followed by coma, and the patient dies without regaining consciousness. At autopsy, the most striking and constant finding has been fatty infiltration of the liver.

Concerning the cause of post-anæsthetic acidosis there is no general agreement. Indeed, its very existence has been doubted. Hewitt (11) states that he has not seen a single unquestionable case in 20 years' practice. Four hypotheses have been advanced to explain the condition. (I) Carmichael and Beattie ascribed the fatal result in their case to "idiosyncrasy." (II) Lorenz (12) has shown that gastro-intestinal disturbances may, in themselves, be responsible for the appearance of an acetonuria. It is by no means unthinkable that the well-known gastric upset following general anæsthesia may be, in some cases at least, the cause of the urinary findings. (III) As Guthrie judiciously remarks, the small amounts of anæsthetics used could not be held at fault for the untoward later course, and the essential etiological factor may be some pre-existing metabolic fault, possibly associated with fatty changes in the liver. (IV) Kelly believes that nervous influences play an important causative rôle in the production of the symptom-complex, "a toxic substance acting on the psycho-motor centers." Brackett, Stone and Low also lay great stress upon a neurotic element.

My especial attention was brought to the subject by a case under my charge, whose history was briefly this: Injured in a trolley wreck, a boy of eighteen was brought to the clinic with extensive lacerations of his left leg and a simple fracture of the femur. Under ether anæsthesia a reparative operation was done, which lasted about three-quarters of an hour. Recovery from the narcosis was quite normal. On the next day, however, the patient became nauseated, restless and rather irrational. His pulse was 120, of rather poor volume and low tension, temperature 99° F. On examination of the urine a large amount of acetone with a strong trace of diacetic acid was found. He was given normal salt solution subcutaneously and per rectum. Sodium bicarbonate was added to the rectal salt solution and large doses of this alkali were administered by mouth. In 24 hours his symptoms had disappeared and with them the acetone and diacetic acid from his urine. At the suggestion of Dr. R. T. Miller, Jr., then resident surgeon, I began making routine examinations of the urine of patients under my charge. The urine was examined on admission, and again on the first, third and fifth days after operation. Legal's (13) well-known test was used for the detection of acetone, and Gerhardt's ferric chloride test for diacetic acid. No attempt at selection of cases was made. The operative procedures included varied from incision and drainage of abscesses requiring but a few moments to dissections of two hours' duration. The anæsthetics used were ether, chloroform, nitrous oxide or cocaine (1-1000 and 1-3000 dilutions). The duration of post-operative nausea and vomiting and the length of time the patient was starved were also noted. The object of the research was to get some idea of the proportion of cases showing a post-operative acidosis and to determine, if possible, the cause of its appearance. I was able in a few cases to obtain the urine of surgical cases who had undergone 24 hours' starvation previous to operation; the results of analyses of their urine are included in the table given below.

Sixty-nine patients showed no acetone or diacetic acid in their urine before being operated upon.

The following table shows the condition of the urine of these patients after the operation:

	Ether.	Chloroform.	Nitrous oxide.	Cocaine.	24 hours' starvation.
No acetone. No diacetic acid	20	4	5	2	3
Acetone present. No diacetic acid	14	1	2	4	2
Both acetone and diacetic acid present...	8	1	2	1	0

Three cases had definite acetonuria on admission. All three of these showed marked increase in the amount of acetone, and also the appearance of diacetic acid in the urine after operation. Both of the cases who had an acetonuria after 24 hours' starvation were tremendously upset and nervous over the operation they were about to undergo, and both showed marked increase in the amount of acetone immediately after narcosis. The acidosis was found after chloroform, ether, nitrous oxide, and cocaine. There was no certain relation between the variety or amount of anæsthetic, or the length or character of the operative procedure, and the amount of acetone and diacetic acid found in the urine after operation. Much nausea and vomiting were observed with but little acidosis, and a few patients with very considerable amounts of acetone scarcely vomited at all. Those individuals who were most worried and depressed before operation seemed most likely to have an aciduria afterwards.

Acetonuria is perhaps much more common than is generally recognized. Kelly enumerates sixteen conditions in which it has been found; viz., diabetes, starvation, malignant tumors, digestive disturbances, septic processes, infectious fevers, pregnancy associated with a dead fœtus, psychoses, autointoxications, chronic morphinism, phosphorus poisoning, following general anæsthesia, in cerebro-spinal injuries, shock due to injury, fatty liver, and uræmia (?) (a fairly

comprehensive list). Beesley (14) differentiates, from a prognostic point of view, between an acute and a chronic acetonuria.

A phenomenon observed after four different anæsthetics in a certain proportion of cases could scarcely be called an "idiosyncrasy." It seemed to me that the lack of relation between the duration of starvation and the amount of acetone found made it rather unlikely that loss of food or digestive disturbances were responsible for the condition. Surely the anæsthetic itself is not to blame, for an acidosis is found after four very different narcotics. There must be some metabolic disturbance accompanying or possibly preceding the surgical operation. The nervous element seemed the most constant in relation to the acidosis.

Conclusions:

(1) Surgical anæsthesia is followed in a certain proportion of all cases by an acidosis recognizable clinically by the presence of acetone and (less often) of diacetic acid in the urine.

(2) The character and amount of anæsthetic used and the duration and character of the operation are of little, if any, importance in determining the appearance of a subsequent acidosis.

(3) Starvation and digestive disturbance are not accountable for the condition.

(4) Emotional individuals are more prone to a post-operative acidosis than the more phlegmatic.

I wish to express my indebtedness to Dr. W. S. Halsted for permission to report these cases, and to Dr. Miller for suggestions and help.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

February 15, 1909.

Meeting of the Johns Hopkins Hospital Medical Society. Dr. Frank R. Smith, the president, in the chair.

I. The Electron and Some of Its Applications. DR. HARRY C. JONES.

Dr. Jones gave a very scientific description of Thomson's theory of the electron and its justification. The deductions, based upon what Dr. Jones calls one of the most brilliant experiments the world has ever seen, show that there is a particle called the *corpuscle* split off from any gas when an electrical discharge is passed through it. This corpuscle has about 1/800 the mass of the hydrogen atom, carries one unit of electricity, and is the same regardless of the nature of the gas from which it is split off.

The line of reasoning was then sketched which led Thomson to conclude that the "corpuscle" contains no matter at all—nothing but the electrical charge. Electrical charges moving rapidly through a perfectly elastic medium such as ether have both mass and inertia; and Thomson showed that all of the mass and inertia possessed by the corpuscle can be accounted for by the electrical charge alone. This charge he termed the "*electron.*"

From the work of Thomson and others all matter is probably made up of positive and negative electrons, the electrical counterparts of each other.

The application of the electron conception was made in several directions. The ordinary definition of the chemical atom laid stress upon its indivisibility. But now it is highly probable that the atom of hydrogen, for instance, is composed of at least 800 electrons distributed in some way throughout the atom. The exact distribution in three dimensions was too difficult a problem for even Thomson to solve. Thomson, however, did show the arrangement of the electrons is such that the interelectronic spaces bear approximately the same relation to the spaces occupied by the electrons, as the interplanetary to the planet spaces. The atom is then an extremely complex system, each constituent moving with a definite velocity and in its own orbit.

The application of the electron theory in explaining the dissociation of a salt by water is very simple. One or more negative electrons is transferred from the positive to the negative constituent, and the former is thus left positive, the latter becomes negative.

Chemical valence is also readily dealt with by the electron theory. A univalent positive element carries one more positive electron than negative, a bivalent two more positive electrons, and so on. If the negative are in excess by one electron, negative univalence results. This definition of valence has a rigid, physical basis.

Matter is known to contain "energy" in some form, since energy can be obtained from it: for example, heat from the carbon atom. From the electron theory, the atoms making up matter are composed of great numbers of electrons moving with high velocities. The kinetic energy of these moving

electrons is necessarily very large. The transformation of a part of this energy into heat, light, or electricity enables us to explain physically the sources of these forms of energy, which has hitherto been referred rather vaguely to intrinsic energy. The electron theory enables us to interpret the fact that radium will give out enough heat to melt its own weight of ice every hour during its entire life, which is between 2000 and 3000 years. This is several million times the amount of heat liberated in the most exothermic chemical reaction. This tremendous amount of energy must come ultimately from the kinetic energy of the electrons within the radium atom. If we regard the atom, as formerly, as an ultimate unit, then we can form no physical conception of what intrinsic energy really means.

II. Hemiplegias of the First Decade. Dr. Henry M. Thomas.

Dr. Thomas reported an analysis of the hemiplegias of the first decade of life occurring in the neurological dispensary and the medical clinic of the hospital; 132 cases in all were divided as follows:

Congenital	36
In acute epidemic diseases	28
In undetermined illnesses	15
From other definite causes	20
Associated with convulsions	24
Developing without given cause	9

The majority of the congenital cases in this series were due to the accidents of labor. Hemorrhages during labor are not uncommon, every baby, as a rule, suffering some small hemorrhages. Howe has found retinal hemorrhages in a large proportion of the newborn—as much as 20 per cent after normal labor, and 50 per cent in the cases of contracted pelvis. Hemorrhages about the upper spinal cord are attributed to premature labor and asphyxia by Little. Of 959 cases dying at birth or in the first year Weyhe found 122 with intracranial hemorrhages. Prenatal encephalitis, described by Virchow, has not been confirmed by later observers. Intracerebral hemorrhage does occur in the fœtus, and accounts for some of the congenital cases. One autopsy record of Dr. Thomas' and three in the literature were of cases of cerebral hemorrhage in fœtuses found postmortem in utero.

In acute infectious diseases it is due to hemorrhage, thrombosis, embolism, or encephalitis. The cases were divided as follows:

Whooping cough	7
Typhoid fever	5
Measles	5
Diphtheria	4
Tonsillitis	1
Gastro-enteritis	3
Marasmus	1
Pneumonia	1
Croup	1
Congenital syphilis	4

In whooping cough it is due to hemorrhages from venous congestion. Smithies reports nine cases in typhoid fever, due to thrombosis. In measles it is a thrombosis or encephalitis according to Struempell.

The undetermined acute illnesses usually amounted to fever and convulsions followed by the hemiplegia. It is probably an encephalitis analogous to poliomylitis of the cord.

Twenty-four cases were associated with convulsions without fever, the paralysis occurring after the convulsions had ceased. The hemiplegia is possible from hemorrhage due to the convulsion itself.

Finally, without any cause, such as a heart lesion, hemiplegia has occurred like a bolt out of a clear sky, developing just as the apoplexy of old age. One case has occurred in each year of life from one to nine.

March 1, 1909.

Meeting of the Johns Hopkins Hospital Medical Society. Dr. Frank R. Smith, the president, in the chair.

I. Intestinal Obstruction: An Anatomical Study. Dr. J. W. Draper Maury, New York.

During the past four years, something over 400 experimentally-produced intestinal obstructions had been made and studied at the Surgical Research Laboratory of Columbia University. This was the largest series, so far reported, of obstructions occurring in the duodenum and jejunum. Of obstructions situated in the aboral portion of the jejunum, the ilium and colon, no mention was made because the studies had purposely been confined to so-called high intestinal obstruction.

All the experiments had been done in the same general way, namely, at time of the production of obstruction, a potential drainage had been arranged for by the making of a so-called twine triangular gastro-enterostomy. This control was used as a time unit in studying the different lethal outcomes of the experiments. A considerable sized series was used in determining that the presence or absence of food in the intestinal canal had nothing whatsoever to do with the cause of death. Other studies corroborated the findings made at the Johns Hopkins Hunterian Laboratory, and elsewhere, that death was not due to a bacterial invasion which had entered the body, as until now, there has been adequate and reasonable ground for supposing, through the devitalized intestinal wall oral to the obstruction. This, it should be remembered, referred exclusively to the obstruction situated in the region of the duodenum only. For one important point of the studies was that the death occurring in this region was of a quite different type from that which was to be dealt with when the ilium or lower bowel was obstructed.

It was noted that the smallest amount of drainage of the duct-bearing region of the duodenum would permit of life continuing during the triangular control; also that if the obstruction were situated 35 centimeters or more aboral to this region, the animals would live until drainage was established at the stoma.

The drainage of the bile was discussed with the conclusion

that it had little or nothing to do with death from intestinal obstruction.

The pancreatic secretion, however, appeared to play a rather important part in the lethal outcome, because in many cases it was noted that death would occur if the obstruction were placed just aboral to the pancreatic duct, whereas if placed just oral to it, dogs would usually live throughout the stoma control. In like manner, the supposed toxic secretions of the stomach were shown not to be so important a lethal factor as had been supposed by some observers, because of the fact that complete pyloric stenosis was in no way so fatal as was obstruction occurring within the 35 centimeter limit and situated aboral to the pancreatic duct.

The speaker suggested that these observations might be interpreted as showing the nature of the cause of death in high intestinal obstruction to be a physiological rather than a pathological one, and that the source of the lethal material was the duct-bearing portion of the duodenum. He further pointed out that the studies indicated a very close physiological balance between the duodenum, the stomach, the pancreas and the liver. The morphological relationship of these parts had been graphically portrayed by Mumford, who said that this portion of the intestine resembled a stem having three apples pendant from it.

The final conclusion of the studies was that death in duodenal obstruction might be due to a disturbance of the intra-enteric balance between enzyme and unknown anti-bodies. It was not due in the slightest degree to the local or remote injury resulting mechanically from the obstruction. It was not, in the portion of the intestine referred to, due to the action of bacteria or their products, and, finally, the presence of decomposing food played no part whatsoever in the process.

The therapeutic deductions were left in the hands of the clinical surgeon.

Discussion.

Dr. Welch.—This paper illustrates the interesting and valuable results which are coming to physiology and pathology from the surgeons. This extremely complex and difficult subject is being enriched by their contributions of even routine work.

The effects of obstruction at different levels are interesting. The death from obstruction below 35 cm. is not the same as that higher up. The pancreatic juice plays a rôle in this kind of death, although Opie's work has shown that death is not due to tying off of the pancreatic ducts. The part of the intestine in which bile and the pancreatic juice is poured is a kind of organ with a delicate balance in enzyme production. The symptoms are due to intoxication, not infection. It may be due to an upset of the balance of the enzymes so nicely adjusted in this portion of the intestine. As to the attempts to isolate the toxin, that may be impossible even when continued absorption proves toxic.

We are very fortunate in having this presentation here!

Dr. Finney.—An admirable presentation! It is an interesting question to surgeons who are constantly meeting with these clinical problems. Familiar questions arise.

It is not difficult to diagnose and localize obstruction as a rule. Immediate and more pronounced symptoms occur if the obstruction is high up. The mortality is greater. Dr. Maury has suggested the explanation. Obstruction to the circulation is always found. Murphy shows the condition is more serious in the event of venous than of arterial obstruction. Has Dr. Maury taken this into account?

Ten years ago, first, I noticed a very well-marked dilatation of the duodenum with thinning of the wall. Simple mechanical obstruction to the lumen does not explain this. I have never found a satisfactory explanation.

Dr. Bloodgood.—This sort of work has great importance in the advance of surgery. Such work as this, first, has shown that death in hemorrhagic pancreatitis is due to trypsin. It was formerly accredited to shock. The importance is seen in the indications for operation, formerly thought to be contraindicated on account of the shock.

The mortality, secondly, in intestinal obstruction is high. Clinically, obstruction at the ileocæcal valve causes death in seven to ten days; higher up, in four to five days. Most important is evacuation of the distended portion of the intestine, and the higher up, the more necessary even in early operations. The question arising is the technique of this evacuation. Maury has mentioned washing out. It should be emphasized.

Thirdly, are we not all long-looped dogs? and the cases of high intestinal obstruction short-looped dogs? Watts has shown the efficacy of transfusion. So we would recommend:

(1) Washing out through the stomach; (2) direct transfusion of blood.

Dr. Maury.—I have already referred to an operation where the ileum was cut near the ileocæcal valve and the end anastomosed to the stomach. These animals live from two to three weeks without many signs of intoxication or shock. They are evidence of the elimination of shock.

I have not done any experimental work with the introduction of the contents of short-looped bowels into another dog. And I have no specific observations upon the dilatation of the duodenum. Death is too rapid for a mechanical dilatation. It seems as if it were a relaxation of the duodenal wall.

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NOTES ON NEW BOOKS.

On Infantilism from Chronic Intestinal Infection. By C. A. Herter, M. D. Price, 90 cents. (*New York: The Macmillan Company, 1908.*)

In recent years, during which such remarkable discoveries have been made concerning the far-reaching influence of the organs of internal secretion upon metabolism and growth, there has been a tendency to regard all disturbances of growth and general metabolism as due to the derangement at some point or other of this important group of organs. Dr. Herter adopts a quite different line of investigation, however, in attempting to establish the nature of those cases in children in which, with practical cessation of growth, he finds evidences of intoxication and abnormal intestinal infection. The cases of so-called infantilism are peculiar inasmuch as the bacteria found in the intestine are those which are characteristic of the nursling period. Gram-positive microorganisms, especially the groups *B. bifidus* and *B. infantilis*, predominate, and the putrefactive processes associated with the presence of such organisms produce such substances as indican and phenol compounds, which are doubtless absorbed and give rise to the symptoms of intoxication which occur. Digestion and absorption of fats are greatly impaired, fatty acids, neutral fat and soaps appearing in the stools, and in consequence of this abundant excretion of such soaps as are formed with calcium, the necessary material for skeletal growth, is lost. Therapeutic measures, especially in the studied regulation of the diet to suit these conditions, frequently give the best results. Errors are, however, followed by relapses, in which the infantile bacterial flora, which practically disappears in the period of improvement, returns as before.

The evidence which Dr. Herter brings forward in favor of the bacterial or infectious nature of the whole process is strong, but perhaps not quite conclusive, for the disturbances of digestion and absorption might perhaps be conceived of as affording a favorable basis for the growth of such bacteria. The book is written, however, in such a way as to impress one with the great care with which the work has been carried out, and to make it difficult not to accept all the conclusions.

Progressive Medicine. Vol. I. March, 1909. (*Philadelphia and New York: Lea & Febiger.*)

Frazier, Preble, Crandall, Kyle and Duel are the respective authors of the chapters on: (1) The Surgery of the Head, Neck and Thorax; (2) Infectious Diseases, including Acute Rheumatism, Influenza and Croupous Pneumonia; (3) The Diseases of Children; (4) Rhinology and Laryngology, and (5) Otology. This quarterly publication has now been appearing for many years, and it is much appreciated by the profession, as it saves the general practitioner much reading in the journals. It gives him in compact form the opinions of the leading men of the world on the most important questions in medicine.

Epoch-making Contributions to Medicine, Surgery and the Allied Sciences. Being Reprints of those Communications which First Conveyed Epoch-making Observations to the Scientific World, Together with Biographical Sketches of the Observers. Collected by C. N. B. Camac, A. B., M. D. With portraits. Price, $4. (*Philadelphia and London: W. B. Saunders Company, 1909.*)

Dr. Camac has here done an admirable piece of work, which will be received with gratitude by every true student of medicine. This collection of contributions is one with which we should all be familiar. Without a knowledge of the great discoveries in medicine one cannot have a true appreciation of its growth and development, and this knowledge could not previously be had by many of us, who either did not read foreign languages or were without access to the necessary books. With this book on our shelves one can at once turn to the original papers by Lister, Harvey, Auenbrugger, Laennec, Jenner, Holmes and the group of Morton, Wells and Warren, with whose names the discovery of anæsthesia is connected, and Simpson, the first user of chloroform as a narcotic. The book is and will ever be a source of infinite inspiration to the imaginative student, and, above all, should he be impressed by the modesty and simplicity of these great men.

New and Non-official Remedies, 1909. Containing Descriptions of the Articles which have been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association, Prior to Jan. 1, 1909. Price, cloth, 50 cents; paper, 25 cents. (*Chicago: Press of American Medical Association, 1909.*)

The thanks of all practitioners will go to the Council for this most useful manual, which is sold at such a moderate price that any doctor can afford it. The title of the work is its best description; and needs but little amplification. Under the name of each remedy is found its definition, its mode of preparation, its actions and uses and its dosage. As many of these remedies are in common use, this information is especially valuable, as it could not be found elsewhere without elaborate research. In issuing such a publication the Council stamps once again its great value to the entire medical profession, who may well be proud of the men who devote their time so generously to aiding the profession.

Third Scientific Report on the Investigations of the Imperial Cancer Research Fund. By Dr. E. F. Bashford. Price, 15*s*. (*London: Taylor & Francis. Red Lion Court, Fleet Street, E. C., 1908.*)

The First Scientific Report appeared in the spring of 1904 and the Second a year later. Thus the present volume represents the results of over three years' work carried on by a number of investigators under Dr. Bashford's supervision. Each observer has contributed a monograph, embodying the results of his special line of study, and these monographs, having been arranged in as logical a sequence as possible, are substantially bound in a single large octavo volume of 433 pages, which constitutes the Third Report.

The contributions fall naturally into two main groups, the first of which is much the smaller, and is concerned with matters of more general interest bearing on cancer, while the second forms the bulk of the report and details a variety of experimental cancer studies among small laboratory animals, especially white mice.

In the first group of papers very interesting and illuminating data have been collected, dealing with the ethnological and zoölogical distribution of cancer. The facts recorded seem to justify the conclusion of the authors that cancer is ubiquitous in man and vertebrate animals.

Special attention is given to the question of the incidence of cancer. Vital statistics are given, emphasizing its frequency, which alone furnish a humiliating record of the ravages of this disease, which has thus far stubbornly and successfully resisted every effort to control it. The authors wisely caution against drawing hasty conclusions from comparison of vital statistics of different countries until these statistics become much more accurate than at present. No reliable universal statistics are at present available, upon which one can base a conclusion as to whether or not cancer is increasing. The experimental study of cancer is

doing much, however, to remedy this state of affairs the world over.

The second group of papers records the results of a variety of laborious and painstaking researches on the malignant tumors of mice. Every paper is interesting and bears the stamp of accurate scientific study. The questions of hereditary influence; of resistance and immunity; of variations in growth-energy, or malignancy exhibited by a tumor carefully observed over a long period of time; the study of "early stages" to discover the factors at work in determining the fate of a graft; sarcomatous transformation in the course of carcinoma propagation; intimate histological study, often in serial section, of primary tumors and of metastases; the influence of surgical interference, and of various other factors on the growth of tumors; and finally, certain chemical and metabolic studies; are but a partial list of the problems receiving attention in this volume.

The frank publication of the laboratory technique and methods of recording tumor growth, with an earnest plea for the adoption of a universal system, is altogether commendable, and furnishes valuable aid to the inexperienced worker.

When it is recalled that this Report is based on a study of 70 propagable malignant tumors in mice, and that the inoculations in Bashford's laboratory now number high in the thousands, the views of these experienced workers on all of the important cancer questions so clearly set forth, are highly acceptable and of great value. They reiterate the views published in a former Report, that the infectious theory, the congenital theory and Ribbert's theory are all untenable and practically disproved in the light of present-day facts. They offer no substitute theory, but throughout the Report they attach noticeable importance to the relationship between chronic irritation and malignant new-growth.

The excellent work recorded in this volume leaves no doubt as to the value of the experimental study of cancer in animals. Dr. Bashford and his co-workers certainly deserve to be congratulated on this splendid contribution, a careful study of which impresses one no less with the vast amount of labor spent in its preparation than with the high excellence of the results obtained. It is of absorbing interest throughout, and leaves the reader in a state of healthy optimism as regards the future of cancer study.

The addition of a classified bibliography; of two appendices, one of which is a handy reference to all the previous publications from the laboratory, and the other a copy of the original scheme drafted by the committee as an outline for the research work of the laboratory; and further, of an excellent index; add materially to the worth of the volume.

The type is clear and attractive; and the numerous illustrations are exceptionally good, especially the microphotographs, which are well-nigh perfect. E. H. RICHARDSON.

Hay-Fever, Hay-Asthma—Its Causes, Diagnosis and Treatment. By WILLIAM LLOYD, Fellow of the Royal College of Surgeons; Surgeon in Charge of the Nose, Ear and Throat Department, Kensington General Hospital, etc. Second edition, 1908. (*London: Henry J. Glaisher; Chicago: W. T. Keener Company.*)

A remarkably valuable book on this little understood disease, subject to but one serious criticism—the last chapter should not have been written. As a clinical description of the affection it is perfect; by long odds the best ever given. Whether Dr. Lloyd is himself a victim of this strange malady does not clearly appear in the text, but I find it hard to believe anyone could so accurately depict the clinical symptoms, in its varying picture at different stages, unless he had experienced them. The brief historical review and the discourse on the cause of the disease are, likewise, very interesting. When it comes to the question of treatment, however, the author falls down badly. His reasoning on general plans of treatment is entirely sane, but his claims as to benefit to be derived from nasal operations are too broad to substantiate. We all acknowledge that where gross nasal lesions co-exist their removal may help, or even cure. We do not believe that ethmoiditis is the cause of the disease, nor that cauterization or slight operative treatments of almost insignificant nasal abnormalities will relieve or cure any considerable number of cases. The last chapter, therefore, which relates 26 cases, with all but one benefitted in this way, is too good to be true. H. O. R.

Blood Examination in Surgical Diagnosis. A Practical Study of its Scope and Technic. By IRA S. WILE, M. S., M. D. Price, $2. (*New York: Surgery Publishing Company, 1908.*)

This is an expensive primer, and as a primer for exact surgical diagnosis is insufficient. The drawings to illustrate the various forms of blood corpuscles are worthless, as they are not reproduced in colors, which is an absolute necessity for one who has made no previous study of the blood. The work cannot be recommended as of real value to any medical man, as there are so many much better books on the subject.

Bacterial Food Poisoning. A Concise Exposition of the Etiology, Bacteriology, Pathology, Symptomatology, Prophylaxis and Treatment of So-called Ptomaine Poisoning. By PROF. DR. A. DIEUDONNÉ, Munich. Translated and edited, with additions, by DR. CHARLES FREDERICK BOLDNAN, Bacteriologist, Department of Health, City of New York. Authorized translation. Price, $1. (*New York: E. B. Treat & Co., 1909.*)

After reading this small volume one feels that the exact knowledge of the cause of this form of poisoning is not yet well understood, and that it will require much investigation to elucidate this obscure problem. Dieudonné's treatise will help many a young student, in the course of his earlier clinical studies, and the translation seems to have been well done. It reads smoothly, and its publication may be welcomed.

A Manual of Bacteriology. By R. TANNER HEWLETT, M. D., F. R. C. P., Professor of General Pathology and Bacteriology, King's College, London. Third edition. (*London: J. and A. Churchill, 1908.*)

This work is well written, and has been brought up to date. It contains a surprisingly large amount of material in compact form. The chapters on the ordinary bacteriological procedures are satisfactory. The various types of immunity and the more important theories are well discussed. Probably too much importance is accredited to vaccine treatment, and especially to Wright's method of determining the opsonic index as a means of controlling it, though reference is made to criticisms of the method. The subject of anaphylaxis and serum disease receives but passing mention. The chapters dealing with the pathogenic organisms individually are quite complete, the protozoan parasites receiving attention as well as the bacteria.

The book is well printed and very well illustrated. On the whole it is a valuable work, and forms a distinct contribution to the subject.

Parcimony in Nutrition. By SIR JAMES CRICHTON-BROWNE, M. D., LL. D., F. R. S., etc. Price, 75 cents. (*London and New York: Funk & Wagnalls Company, 1909.*)

This small volume should be widely read, for it is a plea against the temporarily popular doctrine of Fletcher, that a very little food will suffice the average individual, if it be well-chewed. It is also a plea for a much more liberal diet than that declared by Chittenden as ample for maintaining a healthy condition of mind and body in persons leading ordinary lives, whether muscle or brain workers. To Fletcher's teachings the author pays but little attention—no more than they deserve—but to Chittenden's

work he gives serious consideration. After a careful marshalling of all facts known, however, Sir James Crichton-Browne remains strongly of the opinion that Chittenden has not proven his case, and that it would be a serious mistake for the world at large to accept his (Chittenden's) views, and diminish their diet by one-half or more, as the latter proposes. Sir James has written a most attractive essay, and the reviewer is of opinion that his views on nutrition are the sounder ones to follow.

Pulmonary Tuberculosis. By Sherman G. Bonney, A. M., M. D. With 189 original illustrations, including 20 in colors and 60 X-ray photographs. Price, $7 net. (*Philadelphia: W. B. Saunders Company, 1908.*)

I am sure it will not be considered necessary for the reviewer to have read the whole of Dr. Bonney's book in order to write so modest a notice as this is. It is a formidable volume of 778 pages. I have read nearly the whole of Section 1 and parts of it with care; the chapters on the mode of onset, the symptoms and physical signs of disease and particularly the chapter on early diagnosis. Other portions of the volume I have glanced over, reading enough paragraphs here and there to get a general idea of their plan and contents. Dr. Bonney has written a good book, even though one may criticise many minor details and challenge numberless statements. The style lacks simplicity and inclines to be verbose and in places involved. Sentences similar to the following are not uncommon: "Behring's theory as to the transcendent importance of the infants milk as a carrier of infection, while unworthy of literal acceptance in its entirety, nevertheless is formulated upon certain fundamental truths and to a great extent, therefore, is entitled to a receptive consideration." There are errors of proportion. It seems to us that the Röntgen Rays are not of such unusual importance in diagnosis that their consideration deserves 42 pages of the book and 46 illustrations. Particularly not when tuberculin has but four. Although 24 pages are given over to an account of cases treated with vaccines there is only incidental mention of those methods of tuberculin administration which are most commonly used here and abroad. Out of 88 pages on the general treatment of pulmonary tuberculosis, 33 are used to extol climate, and particularly a special climate. Among many others the following statements would not meet with general endorsement. Speaking of percussion he writes: "In minutely comparing corresponding portions of the chest it should be borne in mind that at the apices front and back, and in the upper interscapular regions, there exists a normal disparity between the two sides, the right being slightly higher in pitch, less vesicular in quality and with diminished intensity."

"In view of a somewhat prevalent misconception regarding the relative value of the various physical signs, it may be asserted that comparatively slight importance attaches to inspection, palpitation or percussion in very early cases."

". . . . the product," speaking of tuberculin, "becomes inert after remaining diluted for more than forty-eight hours." And a few lines lower: "It is usually better to make the injections deeply into the muscles of the back rather than subcutaneously."

Speaking of the differential diagnosis, he quotes a case of recurring hemoptysis due to vicarious menstruation. He fails to state that many authors, and I believe even most, hesitate to admit that hemorrhage from healthy lungs ever occurs as a perverted function. It is well known that hemoptysis in some instances tends to recur at the menstrual period, but I have never seen such a case free from a strong suspicion of tuberculosis. The fact that the patient recovered is no argument against such a view. Certain chapters of the book are unusually well and even strikingly presented and display an intimate acquaintance with the best of tuberculosis literature. Such difficult questions as the relation of human and bovine tuberculosis and the paths of infection are treated with an accuracy and a discrimination scarcely to be expected from one not engaged in their actual solution.

X.

A Laboratory Guide for Histology. Laboratory Outlines for the Study of Histology and Microscopic Anatomy. By Irving Hardesty, A. B., Ph. D., etc., with a chapter on laboratory drawing by A. W. Lee, M. D. Two illustrations in colors. Price, $1.50. (*Philadelphia: P. Blakiston's Son & Co.*)

To quote from the preface: "The purpose of this little book is economy of time and labor for both the instructor and student . . . . an aid toward the accomplishment of a great amount of work . . . . an aid, further, toward an improvement in the quality of that work."

An extended review of the guide book thus offered does not seem worth while. The subject as a whole is taken up in the customary order. The tissues and organs are introduced by an examination of their gross characters and relations. This is followed by study with the dissecting lens, and finally sections and special methods are used. Tissues are selected from various regions of the body, and embryological conditions are constantly referred to.

The topics and sequence are much the same in all of our elementary text-books of histology; but we have here presented a precise method of approach, a prescribed system in which each step is to be made under the author's specific guidance and questions. The system is elaborated with much patience and industry. The questions and suggestions directing attention to all phases of the subject are often very good, though it would demand very special knowledge, if not considerable research, to answer some. No detail seems neglected, even the most apparent structures and relations being pointed out tirelessly. It might be an improvement to omit much that is mere identification or enumeration.

The book is thus seen to be strictly a guide, not an exposition. The technical procedures recommended for the preparation and examination of specimens will be found generally excellent. The pages on histological drawing are novel, and contain much information for the beginner not readily found elsewhere. The section on the Central Nervous System is perhaps the best, though presented in great detail, and demanding a maximum of time and work for this class of students. Much of this might well be classed as advanced study. The references to literature should include more of the great works and less of the relatively trivial.

Such a guide, accompanied by a text-book with figures, may be useful to students who are forced to work alone, but it is not clear that the economy of time and labor claimed will result, for the directions appear to demand an exceptional allotment of attention. While the subject is well systematized, we should advocate more freedom. More emphasis on the fundamentally important relations with less insistence upon the evident, little understood or relatively subordinate.

It seems probable that the improvement in quality of work aimed at by the author would be more surely secured by cutting out much of the required work, and encouraging the student to apply time so gained to approaching special aspects of the subject, under general supervision, in a more self-reliant spirit, using special material or methods.

Diseases of the Nose, Throat and Ear. By Francis R. Packard, M. D. (*Philadelphia: J. B. Lippincott Company, 1909.*)

Dr. Packard has not aimed to produce an elaborate text-book on the nose, throat and ear, but rather to offer to readers a book in which is set forth his own views regarding the care of patients suffering with diseases of these parts. He has devoted a considerable amount of space to a discussion of the treatment of certain conditions which are seen more frequently by the general practitioner than by the specialist, *i. e.*, to tonsillitis, laryngitis,

coryza and hay-fever, which makes the book of considerable value to the family physician. For the general practitioner or the specialist, who desires to know the view-point of a fellow worker of considerable clinical experience in these special branches of medicine, this book will be found to contain helpful suggestions for the conservative treatment of the commoner troubles of these organs.

We congratulate the author on the pleasing way he presents his subject matter to the reader. The reviewer believes that the operations of tracheotomy and intubation should have been included in this book, and space should have been alloted to a full discussion of diphtheria with its nasal and laryngeal complications and the treatment of the same.

American Practice of Surgery. Editors: JOSEPH D. BRYANT, M. D., LL. D., and ALBERT H. BUCK, M. D. Vol. V. (*New York: William Wood & Co., 1908.*)

The comprehensiveness of this work can be estimated from the fact that the entire volume of over 900 pages is devoted to the surgery of the head, pharynx and larynx. Eleven authors have contributed each a chapter. The longest of these, consuming more than a third of the volume, on Surgical Affections and Wounds of the Head, is by Archibald, of Montreal. It is exhaustive, but not easy reading, as the author's style lacks simplicity; he devotes many pages to the physiology of certain cerebral lesions (concussion, shock, etc.), and it seems doubtful whether such considerations are discussed to advantage in a work on practical surgery. With less time than it would take to read these 300 and more pages on the surgery of the head, better and briefer articles on the subject can be found in English. The succeeding chapters are on the cranial nerves, face, hare-lip and cleft palate, eye, ear, sinus thrombosis and labyrinth, pyogenic diseases of the brain of otitic origin, pharynx, larynx and trachea, and laryngectomy. These are respectively written by Frazier, Harlan, Hartley, Knight, Lewis, De Nancrède, Newcomb, Reik, Richards and Stone, known for their special work along these various lines. Just why the surgery of the head should have been so divided up is not clear, and can hardly be said to add to the value of the work, for it makes it unnecessarily long by necessary repetition. To those who enjoy these ponderous systems, this one will prove highly attractive, abundantly illustrated as it is, and with almost all the information necessary for a young surgeon who has had little or no hospital practice. It is representative of American surgery only in so far as it is written by American surgeons, for much of the surgery described has been first put into practice by foreigners. This is well, for it would be unfortunate were there any really opposing schools of surgery. Each country can both give and receive with profit to itself in surgery as well as in law or business, and it is a pity a book should bear a name which is more or less falsely designative. However, what's in a name? It is what is in the book that counts, and the readers must, like the critic, decide this for themselves.

Surgery: Its Principles and Practice. In five volumes. By 66 eminent surgeons. Edited by W. W. KEEN, M. D., LL. D., etc. Volume IV. 1194 pages, 562 text-illustrations and 9 colored plates. Price, $7. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

In this volume is described the surgery of hernia, of the intestines, rectum, genito-urinary organs, eye and ear, as well as military, naval and tropical surgery—a strangely assorted combination of subjects. To the penis and urethra 115 pages are devoted. more than to any other chapter, showing a somewhat uneven disproportion of space, in relation to the importance of the topics treated. The text is well edited, and the papers are written by men who are experts in the subjects they treat. There is a clear and excellent paper by Cabot on Stone in the Bladder, and Young writes with equal authority on the Prostate. No one more competent than De Schweinitz could have been secured to write on the Surgery of the Eye, or Coley on Hernia, or Edsall on Examination of the Urine in Relation to Surgical Measures. O'Reilly's and Rixey's respective contributions to Military and Naval Surgery are timely and valuable. It is not necessary to mention by name the rest of the contributors whose names are all well known to the profession. It is certain that this new Surgery will long retain a prominent position and that it will prove a most serviceable work to the profession. The book is well and not over illustrated, and the publishers may well be content with its appearance. In spite of its many excellencies, the work has some deficiencies. It is desirable that more attention should be paid by the editors to the preparation of the bibliography which accompanies the articles. Only the word "slovenly" describes this work as it appears in this volume. Misprints are numerous, there is no uniform abbreviation of titles, dates are omitted, capitalization is frequently wrong, accents of French words are omitted, in the German titles *Bd.* and Vol. are both used indiscriminately, and *S* (for page) is sometimes used and as often omitted. To note such carelessness may seem hypercritical, but in a standard work of this nature all parts should receive their due attention.

Report on the Prevention of Malaria in Mauritius. By RONALD ROSS, F. R. C. S., etc. (*London: Waterlow & Sons, 1908.*)

The work of Ross is universally recognized to be of such a high order that this new report by him requires no commendation. It is a most thorough-going and painstaking study; almost too scientific for the majority of readers who have no knowledge of higher mathematics. The author has used this science to get at as nearly accurate figures as to the prevalence of malaria in the island as possible, and there is no other study of endemic malaria which furnishes such elaborate statistics. Part I deals with Malaria in General; Part II with Malaria in Mauritius; Part III with the Prevention of Malaria in Mauritius; and there are numerous Addenda. The report has many tables, charts and photographs to make it complete. As an addition to the already large literature on malaria, this study takes first rank.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. Issued Under the Authority of the Government of India by the Sanitary Commissioner with the Government of India-Simla. (*Calcutta: Superintendent Government Printing, India, 1908.*)

New Series, No. 32. An Enquiry on Enteric Fever in India, Carried out at the Central Research Institute, Kasauli, Under the Direction of LIEUTENANT-COLONEL D. SEMPLE, M. D., Director of the Institute, and CAPTAIN E. D. W. GREIG, M. D. Price, 1*s.* 2*d.*

No. 33. The Production of Alkali in Liquid Media by the *Bacillus Pestis.* By LIEUTENANT-COLONEL W. B. BANNERMAN, M. D., etc. Price, 6d.

No. 34. Standards of the Constituents of the Urine and Blood and the Bearing of the Metabolism of Bengalis on the Problems of Nutrition. By CAPTAIN D. MCCAY, M. B., etc. Price, 1*s.* 2*d.*

The Government of India may well be satisfied by the work of its medical officers. It is spending much money on its scientific institutes, and this series of reports is a valuable one. The "Enquiry on Enteric Fever" is perhaps the most important of the three reports which have just been received, as it deals with the problem of the chronic bacillus carrier, a problem which confronts the entire medical profession where typhoid exists, or in other words, the entire civilized world. It is to-day the question of greatest interest concerning this disease, as until it

is possible to eliminate this factor in the propagation of typhoid fever, there is no possibility of controlling it within limits. The typhoid bacillus carrier is almost as great a danger to the community as the consumptive who is not under control. Doctors Semple and Greig, from their most careful investigations deduce the following conclusions, which, while not new, add none the less weight in impressing on the mind of the profession the importance of extreme care in the nursing of typhoid fever patients.

1. *Enteric Convalescents.*—Our investigations have shown that a certain percentage of enteric cases remain infective for a long time. In order to detect such cases the urine and fæces of all convalescents should be submitted to a careful daily bacteriological examination for a prolonged period. By this means it will be possible to state when men are free from bacilli and safe to return to their units.

2. *Enteric Orderlies.*—As has been shown in this report, a number of men, whilst in attendance on enteric fever cases, contract the disease and some of them so slightly that they do not report sick. A certain number of these orderlies become "chronic bacilli carriers," and under the present system, at the end of the period of duty as enteric nursing orderlies, these men return to their units and so take fresh foci of infection to their various stations. By creating a special permanent body of trained men to nurse enteric patients a considerable danger, as regards the spread of enteric fever, would be removed.

3. *Men Dealing with Food Supplies, e. g., in Cookhouses, Dairies, Aerated Water and Ice Factories, etc.*—As we have seen, epidemics of enteric fever can be caused by men dealing with food supply while they are excreting the germ of the disease. The elimination of this danger can be accomplished only by a careful bacteriological examination of all men (European and native) before permitting them to be employed in connection with the preparation and distribution of articles of food and drink.

It will be seen from the above that the problem of the prevention of enteric fever amongst the British troops in India is the detection and isolation of the individual harboring the bacillus typhosus.

The other two reports are of minor importance, but those interested in the questions of metabolism will find Dr. McCay's paper well worth reading. It is impossible to summarize his conclusions, which cover many points, in this brief notice. Dr. Bannerman's study is so purely technical, that only those who have had a chance to study the bacillus will be able to judge of its value.

Experimental Researches on Specific Therapeutics. By Prof. Paul Ehrlich, M. D., D. Sc. Oxon., etc. Price, $1. (*New York:* Paul B. Hoeber, *1909.*)

Under this title the Harben Lectures for 1907 of the Royal Institute of Public Health have been reprinted in a small but neat form. As all investigators in immunity know, all that is written by Ehrlich must be read and carefully studied. He is the leading authority of the world in all questions dealing with the blood, and this reprint of his lectures will be welcomed. They are not easy reading, and require a real knowledge of the subject treated, but they cannot be disregarded by any student who desires to master the intricate problems, that have been developed through the researches of Ehrlich and his followers.

Traité Pratique de Therapeutique Infantile Medico-Chirurgicale. By Paul Le Gendre, M. D., et Aug. Broca, M. D. Second edition. (*Paris: G. Steinheil, 1908.*)

The second edition of this valuable treatise on Therapeutics in Infancy, both medical and surgical, has recently come to hand

The work commences with a general review of infant feeding, natural and artificial. The importance of the examination of mother's milk and the various means of altering the proportion of ingredients in a faulty milk are detailed at length, as well as the hygienic surroundings in which a nursing mother should live. The importance of determining the calorific value of milk, either natural or artificial, is not sufficiently dwelt upon by the authors, and the value of vegetable bouillon is perhaps unduly emphasized; at least, its advantage over cereal waters has not been specially realized in this country.

A valuable chapter follows on the various external therapeutic remedies adapted to the treatment of children, and the means of administering medicines and their dosages are also fully described in a subsequent chapter.

In the second part of the book, diseases, medical and surgical, to which children are liable, are taken up in alphabetical order and in the main are satisfactorily treated. This method rather precludes the thorough and systematic consideration of the various systems and renders the description of the diseases somewhat unsatisfactory. It has, however, the advantage of a ready reference to all the more common ailments, and this is probably what the authors are particularly anxious to provide.

An extensive formulary is appended, which, however, would be much more serviceable to a French student than one in this country.

The book serves a very useful purpose and should find a place in the library of every one having much to do with the treatment of children. J. H. M. K., Jr.

Neurological and Mental Diagnosis. A Manual of Methods. By L. Pierce Clark, M. D., and A. Ross Diefendorf, M. D. Price, $1.25. (*New York: The Macmillan Company, 1908.*)

This is a book of 188 pages, including the index, the first 60 pages of which have been written by Dr. Clark, and which give, in a concise form, the procedure for a complete examination of a patient supposed to be suffering from a nervous disorder. The description is simple and clear, with the exception of one or two instances; for instance, at the bottom of page 7 we find this sentence in describing the examination of the IIId, IVth and VIth cranial nerves:

"The head must be held steady (candle test with red glass in front of one eye)," and we naturally expect a description of this test to follow immediately, but it does not occur until page 10, where it is clearly given.

The second part is written by Dr. Diefendorf, who gives the procedure for the detection of mental disorders, this also being written in an admirable way. In order to make the matter clearer, the seven "common forms of insanity encountered most often by the practitioner" are illustrated by case abstracts in which a full description of the mental examination serves to illustrate the points to which attention was directed in the description of procedure. Finally, there is a glossary of terms used in psychiatry which will be convenient to those entering upon this subject. About the only point on which we differ from the author is the order in which he elicits symptoms, in our opinion it being better to leave the subjects of hallucinations and illusions to the latter part of the examination, when the patient's confidence has been gained, rather than to seek for them in the beginning.

The work is intended as an aid to "the student and general practitioner to make thorough and systematic examinations in nervous and mental diseases," and will undoubtedly be popular, as it is so well and clearly written that it will naturally appeal to beginners in these two somewhat difficult, but important, branches of medicine.

The book is well illustrated by numerous original half-tones, and its appearance is quite up to the standard of the publishers.

W. R. D.

BOOKS RECEIVED.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Edited by J. W. Ballantyne, M. D., F. R. C. P. E. Vol. X. Thiersch-Zymotic. [1909.] 4to. 609 pages. W. T. Keener & Co., Chicago.

A System of Dict and Dietetics. Edited by G. A. Sutherland, M. D., F. R. C. P. 1908. 8vo. 893 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Rotunda Practical Midwifery. By E. Hastings Tweedy, M. D., F. R. C. P. I., and G. T. Wrench, M. D. 1908. 8vo. 464 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Practical Physiological Chemistry. By Philip B. Hawk. Second edition, revised and enlarged, with two full-page plates of absorption spectra in colors, four additional full-page color plates and one hundred and twenty-six figures, of which twelve are in colors. 1909. 8vo. 447 pages. P. Blakiston's Son & Co., Philadelphia.

Appendicitis and Other Diseases of the Vermiform Appendix. By Howard A. Kelly, M. D. With 215 original illustrations, some in colors, and 3 lithographic plates. [1909.] 8vo. 502 pages. J. B. Lippincott Company, Philadelphia and London.

The Herter Lectures (New York, 1908). The Fluids of the Body. By Ernest H. Starling, M. D., F. R. C. P., F. R. S. 1909. 8vo. 186 pages. W. T. Keener & Company, Chicago.

New and Non-official Remedies, 1909. Containing Descriptions of the Articles which have been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association Prior to Jan. 1, 1909. 12mo. 167 pages. American Medical Association, Chicago.

Tuberculosis of the Nose and Throat. By Lorenzo B. Lockard, M. D. With eighty-five illustrations, sixty-four of them in colors. 1909. 8vo. 384 pages. C. V. Mosby Medical Book & Publishing Company, St. Louis.

Manual of Diseases of the Ear. Including those of the Nose and Throat in Relation to the Ear. By Thomas Barr, M. D., and J. Stoddart Barr, M. B., Ch. B. Fourth edition, entirely revised and largely re-written. 1909. 8vo. 477 pages. James Maclehose & Sons, Glasgow.

Hand-book for Attendants on the Insane. Fifth edition, revised and enlarged. Published by the authority of the Medico-Psychological Association. 1909. 12mo. 390 pages. W. T. Keener & Co., Chicago.

Epoch-making Contributions to Medicine, Surgery and the Allied Sciences. Being Reprints of those Communications which First Conveyed Epoch-making Observations to the Scientific World, together with Biographical Sketches of the Observers. Collected by C. N. B. Camac, A. B., M. D. With portraits. 1909. 8vo. 435 pages. W. B. Saunders Company, Philadelphia and London.

Hemorrhage and Transfusion. An Experimental and Clinical Research. By George W. Crile, A. M., M. D. 1909. 8vo. 560 pages. D. Appleton & Company, New York and London.

Parcimony in Nutrition. By Sir James Crichton-Browne, M. D., LL. D., F. R. S. 1909. 12mo. 111 pages. Funk & Wagnalls Company, London and New York.

A Text-Book of Materia Medica, Pharmacology and Therapeutics. By George F. Butler, A. M., Ph. G., M. D. Sixth edition, thoroughly revised and enlarged. 1908. 8vo. 708 pages. W. B. Saunders Company, Philadelphia and London.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis. Volume I. March, 1909. 8vo. 277 pages. Lea & Febiger, Philadelphia and New York.

Manual of Operative Surgery. By H. J. Waring, M. S., M. B., B. Sc. (Lond.), F. R. C. S. (Eng.). Third edition. Illustrated with 521 figures, several of which are in colors. 1909. 750 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Nineteenth series. Volume I. 1909. 8vo. 307 pages. J. B. Lippincott Company, Philadelphia and London.

A System of Operative Surgery. By Various Authors. Edited by F. F. Burghard, M. S. (Lond.), F. R. C. S. (Eng.). In four volumes. Volume I. The Principles and Technique of Wound Treatment, the Methods of Local Analgesia, Amputations, etc. 1909. 8vo. 751 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Text-Book of Medical Chemistry and Toxicology. By James W. Holland, A. M., M. D. Fully illustrated. Second edition, revised and enlarged. 1908. 8vo. 655 pages. W. B. Saunders Company, Philadelphia and London.

Saint Bartholomew's Hospital Reports. Edited by H. Morley Fletcher, M. D., and W. McAdam Eccles, M. S., F. R. C. S. Vol. XLIV. 1908. 8vo. 190 + 287 pages. 1909. Smith, Elder & Co., London.

Papers by J. H. Bryant, M. D., F. R. C. S. Collected Reprints from 1893-1905. London.

Transactions of the College of Physicians of Philadelphia. Third series. Volume the thirtieth. 1908. 8vo. 256 pages. Printed for the College, Philadelphia.

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BULLETIN

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NOTE ON PELLAGRA IN MARYLAND.*

By William Sydney Thayer, M. D.,

Associate Physician, Johns Hopkins Hospital.

The recent recognition of pellagra in the United States, nay, the discovery that the disease is widespread in many parts of the South, would appear to justify a note on two characteristic cases of this disease which have apparently arisen in Maryland, the first that have been described here. Inasmuch as there are not many in the audience who have met with pellagra, a few words as to the history, distribution and nature of the malady may be pardoned.

The disease was apparently first recognized in the Asturias in Spain by Gaspar Cazal. Thierry,[1] physician to the Duc de Duras, ambassador of France at Madrid, in a letter to the dean of the faculty of medicine at Paris in 1755, describes the malady as it appeared then in the Asturias, where it was known as *mal de la rosa* and acknowledges that much of the information has been given to him by Cazal.

Frapolli[2] in 1771 refers to this affection in Lombardy where it was commonly known by the peasants as *pellagra* (*pell'agra* =rough skin). Pellagra was soon recognized in many parts of Northern Italy, while in France it was described in "Les Landes" by Hameau.[3] Although prevalent during the first half of this century in various parts of France, it has now in great part disappeared. The disease exists in many other regions—in Northern Portugal, the Austrian Tyrol, Dalmatia, Croatia, Bosnia, Turkey, Greece, Bessarabia, Kherson and Poland. It is said to have been recognized in Africa by Pruner in 1847. Sandwith[4] in 1898 described the disease in Egypt. In the Western Hemisphere it exists in Mexico, Brazil, Argentine Republic, and is said to occur in the Barbadoes and New Caledonia. Finally, within the last two years the occurrence of the disease in the United States has been recognized. The first mention of this malady in America is by Harris of Atlanta,[5] who, in 1902, reported a case of uncinariasis which presented symptoms simulating pellagra, a case which was unquestionably a complication of the two diseases.

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* Observations made at a meeting of the Johns Hopkins Hospital Medical Society, May 17, 1909.

[1] Description d' une maladie appellée *mal de la rosa*. Recueil périodique d' observations de médecine, de chirurgie, et de pharmacie, 2e édition, June, 1755, II, Paris, 1783.

[2] Animadversiones in morbum vulgo pellagram. 8°, Mediolani, 1771.

[3] Cited by Gaucher. Maladies de la Peau. Brouardel et Gilbert. Nouveau Traité de Médecine et de Thérapeutique. Fasc. XIV, 8°, Paris, 1909. Baillière, p. 41.

[4] Pellagra in Egypt. J. Trop. M., Lond., 1898-9, I, 63-70, 1 Pl.

[5] Anchylostomiasis in an individual presenting all of the typical symptoms of pellagra. Am. Medicine, 1902, IV, 3, 99.

In 1907 Searcy[6] reported an epidemic of acute pellagra in the insane asylum at Mt. Vernon, Alabama. In the same year Merrill,[7] of Colorado, Texas, reported a case, and later J. W. Babcock[8] published an important note on the existence of the disease in the South Carolina State Asylum for the Insane. Since this time confirmatory reports as to the existence of the disease have been published by J. McCampbell,[9] N. M. Moore,[10] King,[11] S. Leach[12] and Randolph.[13]

In October, 1908, a conference on pellagra was held under the auspices of the State Board of Health of South Carolina in Columbia, at which papers were read by N. M. Moore, E. J. Moore, J. J. Watson,[14] J. L. Thompson, J. H. Taylor, John McCampbell, I. M. Taylor, H. E. McConnell, D. B. Frontis, G. A. Neuffer, R. A. Lancaster, M. Ray Powers, H. H. Griffin, E. M. Whaley and J. W. Babcock. These papers, most of which were published in the Journal of the South Carolina Medical Association, Vol. IV, November, 1908, have been collected in pamphlet form.[15] Through the kindness of Drs. Babcock, Watson, Williams and others I have recently had the privilege of observing a remarkable group of cases of this disease in the State Hospital at Columbia as well as several instances from the surrounding country.

The *symptoms* of this remarkable malady are so distinct that although there are probably many larvate cases, a characteristic example of this disease can scarcely be confounded with any other affection.

Pellagra is characterized by symptoms of three main classes:

(1) Those related to the alimentary tract.

(2) The cutaneous manifestations.

(3) The nervous and mental symptoms.

Among the symptoms related to the *gastro-intestinal tract* are *nausea,* indefinite symptoms of *dyspepsia,* often *vomiting,* but especially *diarrhœa* which is more marked in the morning hours and often obstinate.

One of the most characteristic symptoms is the *stomatitis* which may be extremely severe. The mucous membrane of the mouth is of a fiery red color. Eating and swallowing are extremely painful. Aphthous ulcers develop and often extend over large areas, patches of white macerated epithelium exfoliating and leaving a raw, velvety, fiery red surface beneath. Salivation may be distressing.

The *cutaneous* symptoms are highly characteristic. These begin with an erythema on the backs of the hands and, in those who go bare-foot, on the dorsa of the feet. The palms and soles are rarely affected. At the outset the manifestations consist simply of a slight blush which rapidly assumes a brilliant red color like sunburn. The outlines of the patches are, however, as I have seen in several instances, rather sharply defined, more so than is usually the case with sunburn. This manifestation is always symmetrical. There may be a slight swelling of the affected areas. The blush, at first brilliant red, becomes soon of a deeper, more cyanotic color and may extend downward to the proximal interphalangeal joint, and upward to a point just above the wrist where it ends abruptly. The surface of the skin in these affected areas soon becomes dry, harsh and scaly, finally exfoliating in flakes or scales of considerable size or sometimes, especially about the edges, in finer bran-like particles. This dry exfoliating skin often becomes of a deep brownish color; cracks and fissures form. In severer cases, over the greater part of the backs of the hands there develop shallow bullæ, containing serum or pus or sometimes blood. Large masses of epithelium exfoliate, leaving a raw, red surface. After exfoliation the denuded skin has a thin, atrophied appearance. It has often a glistening, shiny aspect with slight superficial wrinkles and cracks and a deep red color, looking somewhat like the first skin which is formed after a burn. In some cases the brownish discoloration of the exfoliating skin is considerable. Often the cracks and fissures are deep and hæmorrhagic. In marked cases the skin over the dorsa of the last two phalanges becomes dry and of a deep brownish-red color, while the formation of bullæ and exfoliation may extend even to these regions. Similar changes occur on the dorsa of the feet in those who go bare-foot, and in marked cases like manifestations may also be seen over the malar prominences, extending across the bridge of the nose so as to give rise to a butterfly or mask-like appearance. Occasionally, similar cutaneous changes may be seen about the neck as a collar.

There can be no doubt that the rays of the sun have an influence in the production of pellagrous erythema, but while the protection of certain parts may control the appearance of these manifestations or change the shape of the patches of efflorescence, yet it can in no way be mistaken for an ordinary sunburn. These changes appear at a time of the year when the rays of the sun are not particularly intense, and, again, Neusser[16] has pointed out that in Roumania, the Gypsy chil-

[6] Epidemic of acute pellagra. J. Am. M. Ass., Chicago, 1907, XLIX, 37.

[7] A sporadic case diagnosed as pellagra. J. Am. M. Ass., Chicago, 1907, XLIX, 940.

[8] Babcock, J. W., et al. What are Pellagra and Pellagrous Insanity? Does such a Disease exist in South Carolina, and what are Its Causes? An Inquiry and Preliminary Report. Report to South Carolina Board of Health, 8°, Columbia, S. C., Dec. 30, 1907.

[9] Some observations on pellagra in this country with special reference to pellagrous insanity. Charlotte (N. C.), M. J., 1908, LVIII, 83-86.

[10] Pellagra: report of case, with remarks on etiology. J. Am. M. Ass., Chicago, 1908, LI, 1076.

[11] Pellagra with report of cases. South. M. J., Nashville, 1908, I, 289-293.

[12] A case of pellagra. Tr. M. Ass., Alabama, Montgomery, 446-452.

[13] Notes on pellagra and pellagrins: with report of cases. Arch. Int. M., Chicago, 1908-9, II, 553-568, 1 Pl.

[14] I have recently, through the kindness of Dr. J. J. Watson, had the privilege of reading the manuscript of a communication read by him before the Chester Co. Medical Society last fall, in which he discusses the disease on the basis of the study of one hundred cases in Italy and South Carolina.

[15] Conference on Pellagra, etc. 8°, Columbia, S. C., 1909, The State Co., Printers.

[16] Die Pellagra in Oesterreich und Roumania. 8°, Wien, 1887.

dren, who run about entirely naked, show a distribution of the lesions which is exactly the same.

Nervous and mental manifestations are almost always present. Vertigo is common. The graver nervous symptoms are mainly referable to the spinal cord and point to varied and combined lesions. In severe recurrent cases there may be a general increase in the deep reflexes, especially, however, in the lower extremities. Well marked spastic symptoms may occur and in some instances disturbances of sensation and paralysis of the sphincters. In other cases the reflexes of the lower extremities may be lost; those of the upper extremities increased. Anatomically, sclerotic changes are found, especially in the lateral columns of the dorsal cord, but lesions of the posterior columns are also not uncommon, and Sandwith [17] has described degeneration of posterior roots. An excellent account of the nervous manifestations of pellagra may be found in the "Referat" of Tuczek.[18]

The mental phenomena of the disease are exceedingly interesting and are well summarized by Neusser.[19] In the beginning of the disease there is, as a rule, confusion, weakness of judgment and will, feelings of anxiety, disorientation as to time and place, disturbances of the patient's disposition all the way from a slight depression to hypochondriacal fancies and suicidal tendencies. The patient is often silent; his expression is dull and serious; he looks, as Dr. Watson has expressed it, as if he had forgotten how to smile. There may be self-depreciation, delusions of persecution, self-accusation, refusal of nourishment. Often maniacal symptoms are observed in that the previously depressed and stuporous patients become suddenly emotional and restless. After such excitement the worn-out sufferers fall into an apathetic condition with, often, kataleptic phenomena. Hallucinations of sight and hearing are common. Mutism is apparently frequent. In the final stages the defects of intellect progressively increase, the memory is lost and the patients become profoundly demented. In chronic and recurrent cases dementia is a common result. In Italy it is estimated that one-tenth of the cases become permanently insane.

The disease is met with in two main forms; (1) as an *acute typhoidal condition;* (2) as a *milder chronic,* and commonly *recurrent malady.*

In the first form the disease is acute and fatal, running its course in a few weeks with active delirium, fever and uncontrollable diarrhœa.

In the second form the disease may run a chronic course with relapses lasting, in some cases, as long as 25 years. The severer cases run, however, a much shorter course. With each relapse emaciation, anæmia and debility increase, and with the progression of severe nervous and mental symptoms the patient becomes profoundly cachectic, demented and bed-ridden, partly, as Neusser has said, because of weakness, partly because of changes in the cord. For an excellent discussion of the disease I would refer to the articles of Neusser (Op. cit.), Tuczek (Op. cit.) and Sturli,[20] in the "Proceedings of the German Society of Naturalists and Physicians for 1905" as well as to the "Précis" of Dr. Lavinder.[21] A good account of the disease may also be found in Gaucher's fasciculus on diseases of the skin (Brouardel et Gilbert's "Nouveau Traité de Médecine et de Thérapeutique. Fasc. XIV. Maladies de la Peau." Paris, 1909. Baillière).

One of the most remarkable features of pellagra is its peculiar *seasonal relations.* The onset is generally in the spring months. In Italy this occurs in the early spring; during the summer the condition tends to improve with an occasional relapse or exacerbation in October, after which the symptoms ameliorate to disappear entirely by the new year. The patient may then seem apparently well, but in the succeeding spring another recurrence follows. This probably continues indefinitely, unless the conditions of living are changed for the better.

In Italy, where the disease has been best studied, the number of cases is really considerable. Pellagra exists, however, only among the poorer classes. In Lombardy where the disease is still very prevalent the number of cases in 1907 was estimated to be as large as from 3200-3500 out of a population of 543,961, *i. e.*, one case in every 160-170 of the population, while the mortality from pellagra in 1907 for this province was 18.2 per 100,000 inhabitants. In Padova the death rate from pellagra in 1907 was 36.6 per 100,000 inhabitants which indicates an enormous number of cases in comparison to the population, especially when one considers that the mortality from the disease is only about 2.5 per cent. But the general conditions in Italy are improving greatly under vigorous and well planned preventive and curative measures which have been directed toward (1) the exclusion of spoiled corn; (2) the education of the peasant in improved methods of agriculture; (3) the introduction of artificial dessicating plants for corn; (4) the erection of public store houses; (5) the establishment of rural bakeries which furnish well-made wheaten bread to the peasants; (6) the establishment of corn exchanges where mouldy corn may be exchanged for good; (7) the founding of local hospitals and sanitaria; dispensaries and economic kitchens for the distribution of proper food.

There are in Italy 22 special hospitals (*Pellagrossari*) for the care of patients suffering from the disease.[22]

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[17] Three fatal cases of pellagra with examination of the spinal cord. J. Path. & Bacteriol., Edinb. & Lond., 1900-1901, VII, 460-464.

[18] Ueber die nervösen Erscheinungen der Pellagra. Verhandl. d. Gesellschaft deutsch. Naturf. u. Aerzte, 1905, Leipz., 1906, I Theil, 283-300.

[19] Das Krankheitsbild der Pellagra. Verhandl. d. Gesellsch. deutsch. Naturf. u. Aerzte, 1905, Leipz., 1906, I Theil, 251-269.

[20] Ueber die Aetiologie der Pellagra. Verhandl. d. Gesellsch. deutsch. Naturf. u. Aerzte, 1905, Leipz., 1906, 1 Theil, 269-283.

[21] Pellagra. A Précis. U. S. Treasury Dept. Public Health and Marine Hospital Service. 8°, Washington, 1908. Government Printing Office.

[22] I have recently had the privilege, through the kindness of Dr. Babcock, of reading a remarkable and most valuable account of Pellagra in Italy—a report to the Dept. of State by W. Bayard Cutting, Jr., U. S. Vice and Deputy Consul. It is greatly to be hoped that this document may be published for the benefit of the public. I am indebted to Mr. Cutting's report for the figures above quoted.

Many *hypotheses* have been advanced as to the *nature* of this remarkable malady. I can here only refer you to the abundant literature upon the subject. Especially valuable are the various articles of Lombroso to which full references may be found in the Index Catalogue of the Surgeon General's Library, while the recent article of Sambon [23] contains many interesting considerations.

Marzari [24] in 1810 first called attention to the fact that the disease prevails especially among those whose main articles of diet are the products of *Zea maïs*—Indian corn. Since this observation it has been shown clearly enough that there is a striking relation between the consumption of corn and the prevalence of pellagra. In those regions in Italy in which the disease is especially frequent the peasants live largely on a sort of corn mush called *polenta* and on soggy, heavy corn bread. The corn of which the meal is made is often harvested too early and stored under such conditions that it becomes commonly spoiled or mouldy. There is good reason to believe that the prevalence of the malady is in some way connected with the consumption of spoiled or mouldy corn. *In Italy the disease is strictly limited to the poor; it is unknown among the well-to-do* who exclude corn from their diet. While notable instances and small groups of cases have been reported in individuals where the consumption of corn has not been proven, yet that there is a relation between the consumption or at least the culture (Sambon) of corn and this disease is accepted by the great majority of observers. Nevertheless, two active schools still exist, the *Zeïsts*, who believe that the disease is due directly to the consumption of maize, and the *anti-Zeïsts*, who deny this relation. Sambon (Op. cit.) who is inclined to doubt the relation of normal or diseased corn as an article of diet to this disease, suggests that, as it is the field laborer who is especially subject to pellagra, and as his neighbor in the city who lives under the same conditions is usually free from the disease, it may be that it is *in the maize field* that the peasant comes in touch with the specific agent of pellagra. The common belief is, however, that the disease is acquired by eating corn which, having been harvested too early and stored under conditions which favor the development of parasitic growths, has become contaminated with some organism or organisms which, either through their own toxic products or through poisons produced by the decomposition of the maize, or both, gives rise in the consumer to the symptoms of pellagra. The results of the campaign against pellagra in Italy, already referred to, tend strongly to support the general contention of the *Zeïsts*.

Of the theories which have been advanced as to the nature of these poisons it will be impossible here to speak. Suffice it to say, that some, as for instance, Neusser,[25] have suggested that poisons might arise from changes in healthy maize in the process of digestion; others, for example, Lombroso,[26] believe that the poisons are chemical substances arising from the decomposition of the corn before its ingestion; others, to the products of changes produced by various special micro-organisms, and bacteria (Majocchi and Cuboni)[27]; or by moulds (Ballardini,[28] Gosio and Ferrati,[29] Ceni,[30] Fossati [31]).

Various observers believe that they have produced pellagra in human beings and in animals by the introduction of different products and extracts of diseased corn or of organisms which have developed upon it, but most of these experiments would appear to be inconclusive.

Before passing on to the report of my two cases let me present several photographs. The first (Photograph 1) is of a case of Italian pellagra in Lombroso's clinic, which was taken for Dr. J. J. Watson, of Columbia, who has most kindly allowed me to reproduce it. The general expression and the changes in the hands and face are rather striking. The second and third (Photographs 2 and 3) are of a remarkable case which Dr. Watson was good enough to show me several days ago. The man, an inmate of the almshouse, was a most striking example of the disease, showing a marked stomatitis with salivation, a persistent diarrhœa, cutaneous changes on the hands and face of a high degree, as are beautifully shown in these pictures. The patient was exceedingly weak; the gait, spastic. There was a great increase in the deep reflexes in both upper and lower extremities; there was a double ankle clonus and dorsal flexion of the great toe on plantar stimulation. The patient was dull; the expression, serious and fixed; he answered questions slowly and in a peculiar monotone; but with these exceptions, there had been no definite mental symptoms.

If now you will compare the brief description of the disease and these photographs with the account of the two cases which follow and the photographs of the second patient, whom I had hoped to present to you this evening, the identity of the conditions will, I think, be clearly evident.

(1) On November 27, 1905, in skimming over a number of medical journals I happened to come across an article on pellagra which I read with considerable interest. On the following day, with this article fresh in my mind, I was called to see Mrs. X., living about fifty miles from Baltimore. The patient was a lady 57 years of age, well-to-do and living in the best general circumstances. The history, exactly as I wrote it at the time, is as follows:

Mrs. X. Aged 57. November 18, 1905.

Family History.—Parents dead. On the mother's side there is an extremely bad history from the mental standpoint—all but one

[23] Brit. M. J., 1905, II, 1272-1275.

[24] Saggio medico-politico sulla Pellagra 1810, Venezia, presso Parolari. Reference taken from Osservazioni del Dr. Cerri, etc., intorno al saggio medico-politico sulla pellagra del Signor G. B. Marzari. Milano, 1811.

[25] Die Pellagra in Oesterreich und Roumänien. 8°, Wien, 1877; Untersuchungen über die Pellagra. Wien. med. Wchnsch., 1887, XXXVII, 132-135.

[26] Sull'eziologia e sulla cura della pellagra. Lav. d. Cong. di med. int., 1892, V, Milano, 1898, 160-186; for the complete references to Lombroso's numerous works on the question see Index Catalogue of the Surgeon General's Library.

[27] Referred to by Sambon (Op. cit.).

[28] Referred to by Sambon (Op. cit.).

[29] Sull'azione fisiologica dei veleni del mais invasi da alcani ifomiceti; contributo all' eziologia della pellagra. Riv. d'ig. e san. pubb., Roma, 1896, VII, 961-891.

[30] Referred to by Sambon (Op. cit.).

[31] Referred to by Sambon (Op. cit.).



1. A case of Italian pellagra in the clinic of Professor Lombroso at Turin. Observe the facial expression, the eruption on the hands and face. Photograph kindly lent me by Dr. J. J. Watson, of Columbia, S. C., for whom the photograph was taken.



2. A case of pellagra under the care of Dr. J. J. Watson, of Columbia, S. C. Note the facial expression and the eruption on the hands and face.

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of her mother's brothers and sisters committed suicide following melancholia. In her own immediate family there have been no cases of this sort. She has had five children; easy labors, and has always herself been a healthy woman with the exception of a very severe case of scarlet fever when a child and typhoid fever in 1884. The daughter says that all her life she has been one who was rather susceptible to cold, living in a very hot house and fearing exposure. For six or eight years her daughter says that she has had a curious tendency to go to sleep, sometimes during conversation, often when she yas playing cards with her friends, and during the last two years her color has changed from a pink and white complexion to an extremely sallow, pale color. One year ago, she consulted a dentist, who refused to fill a tooth because he thought from the patient's appearance that she was "in the last stages of Bright's disease."

Present Illness.—A year ago last June, she began to suffer with diarrhœa in the morning; would be waked up early in the morning by a desire followed by very watery stool. Sometimes this was the only stool in the day, sometimes there would be several more. They were unassociated with pain. At about the same time she began to develop an aphthous stomatitis. Dr. Y. says that the appearances were characteristic, though the aphthous ulcers were rather numerous. At the same time the whole skin became rather dry, the backs of her hands especially, as her daughter expresses it, became "scaly just like the back of a fish." They did not burn and there was no other complaint excepting of soreness and cracking of the skin. After two or three weeks the condition of the skin of the hands and of the mouth cleared up and associated with this, the diarrhœa stopped and the patient was in tolerably good condition until October of the same year when a similar attack came on again. At that time the patient developed rather well marked mental symptoms, was depressed and at the same time rather hysterical. The diarrhœa was more serious; the hands were discolored, purplish brown, not exactly like an ordinary eczema; they were very dry and scaly. The mouth again became very sore and the whole attack lasted five or six weeks. By Christmas the patient was almost well and remained well up to the onset of the present attack.

The present attack began six weeks ago (about October 1), the patient first becoming rather indifferent and manifesting a lack of interest in conditions about her, after which the mouth began to be very sore and burning again, the hands became scaly, red and rough on their backs and finally cracks and fissures appeared as well as large rather loose blebs containing pus, which ruptured spontaneously or on slight rubbing. The diarrhœa, which was sharp at first, lasted about two weeks since when it has disappeared, the patient having now normal movements, one a day. With this attack, however, the mental condition of the patient has grown steadily worse. She has been dull and drowsy and, at times, confused, talking at random and rather incomprehensibly to herself, and of late showing curious jerky twitching movements from time to time.

Dr. Y. has examined the urine repeatedly and found it free from albumin, of a specific gravity averaging about 1015 or 1016. Micturition not especially frequent. The appetite up to the illness was good: since then it has been fair but she has been unable to eat as she would because of the great pain and burning on any attempt to take food.

Status Præsens.—The patient was seen at about quarter past nine in the morning; in bed lying on the right side. She was somewhat restless, moving her jaw frequently as if chewing and nervously moving her hands about under the bed clothes. The patient is of medium size, fairly well nourished, of a remarkably pale, sallow complexion with a mere suggestion of color in the cheeks. Lips and mucous membranes, rather pale, though not as pale as the color of the skin would suggest. The face has a remarkable expression; the forehead is wrinkled much of the time; the eyes, which are rather heavy, are often nearly closed in such a manner as to suggest that there is photophobia although at other times the patient looks directly out of the open window. There is slight lacrimation. There is no fulness above the clavicles. The face has a strangely cretinoid aspect. The skin is dry, ichthyotic in appearance especially over the trunk, rough to the feel; no sign of moisture anywhere. The hair is rather remarkably dry but not exactly lustreless. The patient talks to herself unintelligibly, at frequent intervals, and is confused and wandering, though now and then she answers sharp questions well. There are occasional sudden twitchings of the arms and trunk; the hands move about under the bed clothes much of the time. There was a curious tremor, somewhat like the movements one sees in Friedreich's ataxia. Pupils, equal. (I find unfortunately no note about the reflexes.)

Pulse, 22 to the quarter, of moderate size; rather soft; regular. Respiration, 24. Lungs, perfectly clear on auscultation and percussion. No apparent enlargement of the heart; no accentuation of the second aortic sound. The abdomen is greatly and uniformly distended and everywhere tympanitic. Neither liver nor spleen is palpable.

On the back of each hand the skin is dry, hard, cracked and scaly; in many places reddish-brown in appearance; in places discolored by old dry hæmorrhage. In other places there are areas where the skin is white and loose, evidently the remains of recent bullæ. This condition is uniform on both hands and extends down to the proximal inter-phalangeal joint. The deep redness of the skin, however, extends a little further down the phalanges. It does not extend above the wrist. The mouth shows a high degree of stomatitis. There is a foul pungent odor to the breath. The lips all along the inner surface, show a layer of macerated loose white epithelium, and a similar layer covers the greater part of the tongue and the cheeks. On the hard palate the condition is much less marked. The mucous membrane is of a deep red color though not nearly as fiery red, according to the doctor, as it has been. Along the left leg in particular there are masses of exfoliated epithelium. There is no œdema. The legs are well developed, though not unduly thickened or large.

In the region of the thyroid between the sternomastoids there is a hollow. There is no sign of thyroid either on inspection or palpation.

I was immediately struck by the extraordinary similarity between this case and the description and picture of pellagra. The condition, as I remarked to the physician in charge, was indeed apparently identical. There was but one atypical feature about the case, namely, the October relapse without a spring relapse in the same year. There were, however, several peculiar features in the history of the patient—namely, the striking change in the complexion, the drowsiness, the chilliness, the remarkable facies which had led the dentist to assume that she was "in an advanced stage of Bright's disease." These features taken in connection with the impalpability of the thyroid and the dryness of the skin suggested the possibility of hypothyroidism. It was accordingly determined to start treatment with thyroids, beginning with three 2-gr. (0.13 gm.) doses of dessicated thyroids a day. The change in the patient's condition was immediate and remarkable. I did not see her again, but the attending physician tells me that on the very day that the treatment was begun the patient passed for the first time a quiet night. For several weeks she continued with this dose and then for several months took from four to five grains (0.26-0.32 gm.) daily. The improvement

was rapid, the mental, cutaneous and gastro-intestinal symptoms entirely cleared up, and since then she has remained quite well. The doctor, however, assures me that the patient has found that whenever she has tried to stop the thyroids, of which she is now taking two grains (0.16 gm.) a day, a sense of heaviness and dulness has returned, so that he and she are convinced of the neeessity of eontinuing the treatment.[32]

From the effeets of the thyroid together with the symptoms above referred to it is not impossible that this is an instance of hypothyroidism; the mental symptoms might well be associated with this eondition; but the eutaneous, the buceal, the gastro-intestinal manifestations were so striking that it was difficult to diseard the suspieion of the existenee of pellagra. This suspieion was strengthened upon the reeognition of the disease in the South, and now, sinee I have beeome familiar with the disease, I have no hesitation in presenting the report of this case as a eharacteristie instance of pellagra.

The patient, it should be said, ate the products of maize no more frequently than does any ordinary individual in this region. May it perhaps be that the hypothyroidism rendered her unduly susceptible? Or may it be that in thyroids we have a valuable therapeutie agent. With regard to the latter question, Dr. Babcoek tells me that he has used this substanee in several cases without effect. The question as to the predisposing effect of hypothyroidism is interesting. It is not impossible that an affirmative answer may be justified.

Ever sinee my observation of this case I have been on the lookout for further instanees of the disease. It remained, however, for my eolleague Dr. Finney to direct my attention to the second ease, the first which has appeared at the Johns Hopkins Hospital, a patient who eame to the Surgieal Department on Friday, May 14, 1909.

Case II.—M. J. S., Gen. No. 65,580, married, 35 years old, a driver. The patient comes to the Surgical Department of the Dispensary with the complaints that he "can't swallow"; that "it hurts to talk"; that his mouth and throat and hands are "sore."

Family History.—Father died of tuberculosis, at 38; mother, of "inflammation of the stomach," at 37; two sisters and one brother are well; two brothers and a sister died in infancy. Has been married sixteen years. Wife living and well; three children living and well; five died "of marasmus" under three years of age.

Past History.—The patient says he has always been delicate but never seriously ill. Chills and fever ten years ago. Appetite and digestion have always been good. Gonorrhœa at the age of 17, and, at the same time, a sore on the penis which was not followed by secondary symptoms. At one time he used to drink a great deal of beer; now, several glasses of gin a day. Smokes cigarettes constantly. Lives a rather irregular life, driving a whiskey wagon. The work is light; he takes care of horses and "drives a few orders a day." Two weeks ago he gave his horse several feedings of "chops" with which he mixed medicine to make the horse "slick." This he mixed with his hands and to this act he ascribes his present illness. He denies eating corn bread, corn flakes or hominy.

Present Illness.—Two weeks ago at about the beginning of May, about three days after feeding the horse with the medicated "chops," his hands became, as he expressed it, "chapped," and several days later he applied a salve which he obtained from the druggist. Two or three days after this the hands "broke out in blisters" which broke, leaving the present condition. Three days after his hands became affected the lips and tongue became sore and this soreness has spread back into his throat and is worse now. For six days it has been difficult to swallow. Since the onset of his illness he has vomited several times daily, often nothing but saliva, but he has been very nauseated and since his throat became sore it has been difficult for him to eat or drink. At the time when first seen the patient was rather thin but, in the main, a healthy looking man. There was a very marked stomatitis; the tonguc, lips and palate were fiery red as also were the gums and the mucous membrane of the mouth, where, in many places, over small and large areas, greyish-white masses of macerated epithelium were exfoliating. The hands showed a remarkable condition. The dorsa of the hands were of a deep brownish-red color covered with masses of dry scaly exfoliating skin; in some places evidently the remains of old bullæ. The skin beneath was of a deep red color. This process extended to a point just above the wrists where it ended sharply, and to the proximal interphalangeal joint. Below this, over the phalanges, the skin showed a deep brownish-red pigmentation and in places a suggestion of the beginning of the formation of bullæ; it was harsh and dry. The differences, however, in the stage and the degree of the process on the fingers below the proximal interphalangeal joint and the changes on the back of the hand were striking. The knee kicks were fairly active but not exaggerated. The patient, on questioning, stated also that he had had several movements of the bowels each day which were rather loose; he did not regard the condition as diarrhœa. The picture appeared to me to be typical of pellagra and the patient at his own request, was admitted to the hospital.

On entrance the temperature was 99.8° F.; pulse, 111; respira-

[32] "In regard to the present condition of the skin. The whole cutaneous surface is quite normal, and the harshness and dryness entirely gone. The hands are particularly soft and pliant. There is no discoloration or efflorescence. Her hands are rather smaller than they were five or six years since. This change in the skin began immediately with the improvement of the other symptoms and within five or six weeks they had entirely disappeared, the dryness and the efflorescence, and skin normal.

There has never been any return of the stomatitis or diarrhœa.

I am not sure that Dr. Thayer was fully impressed with one symptom that long preceded the others, was continuous with late developments, diarrhœa, stomatitis, trophic skin changes and disappeared synchronously with these and has never returned,—and that is her very notable somnolence. This was observed by many of her friends and neighbors. If she was playing cards she would frequently have to be wakened up when it came time for her to play. She would go to sleep in a crowded room, doze at the table—fall asleep at any and all times.

In many respects her character is changed. She is more alert than I ever knew her and mentally active. Always having a sense of humor, she has developed some reputation for witticisms. She is very independent and rather aggressive.

No statement can exaggerate the marvelous disappearance of her symptoms. She was apparently moribund when Thayer first saw her and I had abandoned all hope of her survival of more than a few hours. At 4 p. m. of that day she took 2½ gr. of powdered thyroids. Her restlessness ceased at once—that is in two hours. She slept for ten hours and her intelligence fully returned in the morning.

She has never been without the thyroids for more than a week. She fears to go longer, as she thinks the nervous symptoms begin to reappear."—(Quotation from a letter to me about this patient from Dr. Y., dated June 1, 1909. Editor.)



3. The hands of the patient in Plate 2.



4. Case 2. Pellagra arising in Baltimore. Observe the facial expression and the eruption on the hands.



5. Hands of Case 2. The pigmented skin has in great part exfoliated. Observe the sharp outlines of the cutaneous changes and the deep fissures with hæmorrhage.



6. Larger photograph of hands in Case 2.

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tions, 20. At night the temperature rose to 101.7° F.; falling the next morning to 99° F. and rising to 100.8° F. on the evening of the 15th, to fall again to 99.5° F. on the morning of the 16th. The blood pressure was 115. The *blood* showed nothing remarkable in the appearance of the fresh specimen. The count showed red corpuscles, 3,864,000; leucocytes, 6400; hæmoglobin, 84 per cent (obviously a wrong estimate).

Dr. Selling noted that the patient's face was sunburned and that his lips were reddened and bleeding in one or two spots. On removing some of the greyish macerated epithelium from the inner surface of the lips a raw red bleeding surface was left, and the whole area of the buccal mucous membrane was covered with similar patches varying in size from a pin head to a centimetre. The mucosa visible between these areas was very red and in places bleeding. The tongue showed similar areas with marked *pyorrhœa alveolarium*. The lid slit of the right eye was a little wider than the left. Pupils, equal; reacted to light and accommodation. Posterior cervical glands were moderately enlarged. Both epitrochlears were palpable, about the size of beans. Physical examination of the chest and abdomen showed nothing abnormal. There were no scars on the extremities, no nodes on the shins. Ophthalmoscopic examination was negative.

On May 15, Dr. Sladen dictated the following description of his hands and mouth: "The patient's two complaints are the condition of his hands and that of his mouth and throat. The hands are symmetrically affected and only on the dorsa where in a distribution as shown by the photographs, the skin is dry and desquamated, leaving as a remnant a smooth pink skin which is cracked in several places, particularly on the wrist and knuckles, and covered by hæmorrhagic crusts. They look like skin after scalding. No particular pain is associated with them. On the dorsa of the fingers where desquamation has not taken place, the skin is thick, dry and raised in blisters, one of which is hæmorrhagic.

Mouth.—The lower lip is chapped and over the surface of the gums and soft palate the mucous membrane is fiery red and mottled with irregular patches of greyish-white membrane. These are on the under surface of the tongue also. As well as can be seen the pharynx and pillars present the same condition. There was well marked arteriosclerosis, the radials and brachials tortuous and thickened. Knee kicks were active; abdominal reflexes, present; the cremasteric also; the deep reflexes of the upper extremities were active. Mentally he was perfectly clear, rational and well oriented."

The *urine* was yellow; slightly turbid; acid; specific gravity, 1020; a trace of albumin, the sediment showing many pus cells and one granular cast.

The patient had three *stools* the first day and two on the second. These were loose, of a brownish color separated into two layers, the upper fluid, the lower of semi-fluid, rather coarsely granular material. Nothing remarkable on microscopical examination.

Dr. Boggs on the morning of the 16th of May noted that there was "no induration about the margins of the lesions on the hand and very slight pigmentation about the upper edge. The horny layer of the skin is detached to the base of the nail of every finger and there is a slight hæmorrhagic exudation. This layer is not, however, separated beyond the second joint of the finger except on the thumb where it extends almost to the nail and on the right side not quite so far. The palmar surface of the hands is perfectly free. The tongue is very smooth as though the superficial layers of epithelium were loose, of a bright red color. . . . ."

I came into the patient's room just as Dr. Boggs was leaving and, after describing the conditions on entry, made the following note: " . . . .The patient is in bed. Fairly healthy but rather tired looking man; rather sparely nourished. Color of the lips and mucous membranes, good. Tongue and mucous membranes of the mouth are of an intense fiery red color. On the hard palate, buccal mucosa and gums there are everywhere masses of white macerated epithelium which in some places are hanging loose. The intense redness of the mucosa is very characteristic. There is a marked seborrhœa sicca of the scalp. The skin of the neck, face and trunk shows in other respects nothing remarkable, and the feet and legs are perfectly clean. The condition of the hands has changed considerably in the last two days. Much of the dry, brown superficial skin has exfoliated and to-day the dorsa of the hands show a deep red dry surface covered with thin glistening wrinkled scales and many deep, hæmorrhagic fissures. These are especially marked at the left wrist and over the thumb on the same side but there are also deep bleeding fissures on the right, especially on the back of the wrist and over the metacarpophalangeal joint of the third finger. The exfoliative changes stop in great part at the first (proximal) interphalangeal joint, but on the left little finger over the second phalanx there is some dry exfoliating skin, and a loose bulla, in part hæmorrhagic, on the third finger. On the index finger of the same hand the skin is raised by a slight, loose, wrinkled bulla. On the other fingers the skin is dry, hard, slightly reddish-brown in color. The palms of the hands are perfectly clean and the process on the dorsum is limited by a sharp line between the metacarpal bones of the little and third fingers, although outside this, the skin is dry and harsh and exfoliating in smaller bran-like scales. The deep redness is here not present. On the radial side of the hands the process stops a little beyond the middle of the thumb.

The thorax is symmetrical; costal angle, under 90. Movements, aparently equal. Respiration perfectly clear.

Heart.—Point of maximum impulse in the fifth space, just within the mamillary line. Sounds, clear. Aortic second a little louder than pulmonic second.

Abdomen, natural. Spleen, not palpable. Liver, just below costal margin in the mamillary line, indefinitely felt. No special glandular enlargements although an occasional small soft gland is felt in the neck on both sides. . . . . There is a slight reddening at the right elbow joint, probably from resting upon the elbow; the skin not harsh. There is no increase in the deep reflexes of the arms or legs; plantar stimulation is followed by plantar flexion of the great toe. Radial arteries rather thickened and distinctly palpable."

While making this examination it was noted that the patient was somewhat restless, and appeared apprehensive, often raising his head from the pillow during the examination. When, toward the end of the examination something was said about bandaging his hands, he suggested that that be done immediately as he was obliged to go home on the following morning. When asked why he had to go, he said he must look after his horse. He was asked if some one else could not attend to this for him, to which he answered that his son who was there, could do it if he were there to tell him what to do, but that he should be obliged to go home for a few hours on the following day, after which he promised to return. He then suggested again that his hands should be bandaged now and that he could take off the bandages when he reached home, a suggestion which seemed rather pointless. He had a distinctly apprehensive look and his whole conversation suggested slight mental confusion.

Immediately after I left he was dressed in order that his photograph might be taken. He soon became exceedingly impatient, insisting that he must leave the hospital *immediately* and becoming very much excited. While the photograph was being taken he was exceedingly nervous and irritable, refusing to remain quiet, and immediately thereafter he insisted on leaving without further delay. After reaching home the patient talked wildly. He tried to find some liquor and accused his wife of taking it. He said that he had been maltreated in the hospital and that one of his friends had committed suicide with a cap pistol. He

showed disorientation as to time, fancying that he had been at home once before during the morning. He was so obviously out of his mind that his brother tried to persuade him to go back to the hospital which he refused to do, but he was persuaded to go to St. Joseph's Hospital. I have learned since that he entered St. Joseph's Hospital in the evening. During the night he was delirious, got out of bed frequently, threatened other patients and was so noisy and obstreperous that he was put in a cell. He was very noisy and maniacal all night. On the following day when Dr. Hayward saw him he was very much confused. He did not know his name, nor did he realize where he was and seemed to think that he was at a place called "St. Michael's." The case was not regarded as a fitting one for a general hospital and he was taken home by his friends. On the afternoon of May 25, I visited him at his house. He was then lying on a couch, looking perhaps a little thinner than when I last saw him. He had the same dull, rather sad expression. He spoke little but answered questions clearly though he had rather a suspicious look. The stomatitis was somewhat better. The tongue was dry, very red but not quite as fiery as when last seen. The patches of exfoliating epithelium were less marked. The hands were bandaged so that I could only see the last two phalanges where the skin had become of a much deeper brown color like that of the backs of the hands before its exfoliation. On the right malar prominence in a small area the skin was dry and harsh and a little brownish.

In this instance the lesions of the hands and mouth, the diarrhœa, the mental symptoms form a picture too characteristic to admit of serious doubt as to the nature of the disease. Nothing could be more typical of pellagra than the whole complex of symptoms.

The existence of pellagra in Maryland is no more than one might expect in view of the considerable number of cases wihch have been reported through the South. One important question naturally arises with regard to the recent recognition of pellagra in this country. Has the disease existed for a considerable period of time, or has it appeared for the first time within the last few years? The testimony of the physicians and nurses in charge of the State Hospital for the Insane at Columbia, South Carolina, is perfectly definite upon this point. The disease has existed there for at least 18 years, and it is therefore probable that it must have existed unrecognized elsewhere. It would seem, however, very probable that the frequency of the malady has been increasing in the last few years. It is hardly likely that so many cases could have been passed by unnoticed. I feel quite sure that I myself have never seen a marked case of the disease before meeting with the first instance here reported.

It is needless to suggest here that the appearance of pellagra is of very grave significance. The prevailing idea is that the disease is due to the consumption of spoiled or mouldy corn. The disease is really wide-spread in this country. It is apparently increasing. The products of corn are a most important element in the diet of all classes of society in this country. Is there not then perhaps reason to fear a serious increase in the prevalence of this malady? One interesting point is already evident. In Italy where corn is eaten only by the lower classes the disease is absolutely limited to the poor. In this country I have heard within the last year of several acute fatal cases of the disease in individuals living under the best social and hygienic conditions as in my first case. It is most important that every one of us should be on the lookout for fresh cases of pellagra and further investigations into its prevalence and cause should immediately be undertaken.

A REPORT OF TWO CASES OF OSTEOPLASTIC CARCINOMA OF THE PROSTATE WITH A REVIEW OF THE LITERATURE.

By George Blumer, M. D., New Haven, Conn.

(*From the Continuous Medical Service of the New Haven Hospital.*)

The interest in the clinical aspect of bone metastases associated with various forms of new growth has been very keen in the past few years. We have learned that there are certain forms of neoplasm which tend to metastasize in the bones and which may give rise to osseous changes recognizable during life. This aspect of mammary carcinoma has long been known, especially the association of this disease with spontaneous fractures, and with the nervous lesions so graphically pictured by Osler in his article on the medical aspects of cancer of the breast. More recently it has been recognized that certain thyroid and adrenal tumors tend to give rise to bony metastases. In the case of the thyroid the metastases are usually destructive and seem inclined to attack the bones of the head and upper part of the body. In the case of the adrenal the types differ in children and adults, children suffering from the type described by Hutchison, and by Tileston and Wolbach in this country, in which the cranial bones, especially the orbit, are the common site of the secondary growths, and adults being more apt to develop single metastases in the long bones, or if in the skull, not involving the orbit. Bony metastases secondary to prostatic carcinoma are very common, but are not recognized in a majority of cases because they are often unassociated with deformity or visible changes in the shape of the bones. The frequency of this form of bony metastasis and the fact that since Cone, in 1898, no one in this country seems to have paid any attention to this form of growth, leads me to report two cases, one examined post mortem in Albany, in 1901, and one recently seen clinically in New Haven.

Case I.—C. S., aged 60, married, an American, a clerk, applied for treatment at the New Haven Dispensary, February 5, 1908, complaining of cough and pain in the left side of the chest and in the back. He entered my service at the New Haven Hospital April 27, 1908. The following notes are abstracted from the Dispensary and Hospital histories and from the autopsy protocol.

Family History.—His father died of aneurysm at 55. His mother died of kidney disease and uterine trouble at 81. One brother died at 51 of cirrhosis of the liver. One sister died at 50 of cancer of the breast. One sister alive and healthy. He has a son and a daughter alive and well, and lost one daughter in infancy of cholera infantum. He knows of no hereditary disease in his family.

Past History.—He had measles, chicken-pox, and mumps as a child, and a mild attack of influenza five years ago. He had a slight attack of inflammatory rheumatism at 23. He denies venereal disease, and gives no history of secondary lues. He has been a moderate drinker all his life, and an excessive smoker. For the past year he has had to urinate two or three times at night. He has some dribbling of urine after urination. He has pain in the region of the prostate when the bowels move.

Present Illness.—He first noticed toward the end of January, 1908, a short cough followed by pain across the front of the chest, slightly increased by deep breathing but severest when coughing and at night. The pain is situated under the middle of the sternum and radiates laterally. There is pain in the back immediately behind that under the sternum. It is continuously dull and gnawing, with frequent attacks of sharp, lancinating, shooting pain. The pain is getting more severe, and is least noticeable when he is in the sitting position. He has slight dyspnœa, and is getting weak. When first seen, his weight was 143½ lbs., his normal weight being 161 lbs.

When first seen at the dispensary it was noted that he was pale, had thickened arteries, that there was some prominence of the lower ribs on the right side, and that the urine contained pus, but no albumin. I saw him February 7, 1908, and noted that he had on the outer side of the ramus of the left interior maxilla a hard enlargement. It was also noted that the sternum was sensitive on percussion and also the lower end of the left femur. The prostate was noted to be enlarged, especially the left lobe which was hard and a little tender. At this time I made a diagnosis of carcinoma of the prostate with metastasis of the bones.

On his entrance to the hospital, two months later, a complete physical examination showed that he was cachectic looking. His arteries were tortuous and diffusely thickened. The tumor of the lower jaw was of bony hardness. There was enlargement of the glands of the neck on the left side, and of the subclavicular gland on the right side. The outer end of the right clavicle was considerably enlarged, measuring 4.5 cm. from above downward as contrasted with 2.5 cm. on the other side. The third, fourth, and fifth ribs on the right side were slightly thickened and more prominent than those on the left side. The lungs showed the signs of senile emphysema. The heart was not enlarged, but there were systolic murmurs at the apex and over the aortic surface with a ringing second aortic sound. The abdominal organs were negative. The inguinal glands were slightly enlarged. The testicles were normal, and there were no scars on the penis. The prostate was unchanged since the previous examination. There was sensitiveness over the spines of the sixth and seventh dorsal vertebrae. The knee kicks were lively, but nothing else abnormal on the part of the nervous system was dicovered. The superior surface of the pubic bone was irregular and thickened.

After entrance the patient's condition grew gradually worse. He lost weight and strength steadily. The pain in the back took on the character of a girdle pain and became intense, requiring frequent hypodermics of morphine to control it. The bone swellings, with the exception of the clavicular one, showed but little change. Stiffness of the neck and back appeared. The patient began to complain of numbness in the left leg, and there was slight dulling of the sense of pain on that side with an exaggerated knee kick. The urinary symptoms remained unchanged. There was never any obstruction or incontinence. Twelve days before death the clavicular swelling was noted to be softer than formerly, and the day before death it fractured spontaneously. Twelve days before death the right side of the chest became markedly bulged and the left side flattened. The sensation to touch and pain over both legs was impaired, the tendon reflexes were exaggerated, and there was a doubtful Babinski on both sides. Two or three days before death there was slight bleeding from the urethra and hematuria. The patient finally died January 26, 1909, about two years from the beginning of the urinary symptoms and one year from the beginning of symptoms suggesting bone involvement. He died from increasing marasmus, with signs of a terminal pneumonia at the left base.

The urine examined on several occasions showed only traces of albumin and a considerable amount of pus. Near the last there was some pus and a few granular casts. Bence-Jones albumose was never present.

An examination of a test meal was negative.

The blood showed a secondary anæmia. There were several differential counts made, but they showed nothing markedly abnormal. The eosinophiles were never above 4.5 per cent. There were no eosinophilic myelocytes. The basophiles reached 1.5 per cent on one occasion. The leucocytes were slightly increased (11,200). There were no marked changes in the red corpuscles.

The autopsy by Drs. Bartlett and Arnold showed the prostate not much enlarged, measuring 4 cm. transversely. The left lobe was yellowish-white in color, firmer than normal, and infiltrated with new growth. A similar growth infiltrated some of the mesenteric, retroperitoneal, abdominal, bronchial, tracheal and cervical lymph nodes. The internal organs were free from metastases. There was very extensive infiltration of all the ribs with neoplasm, with fracture of the third, fourth, fifth, and sixth ribs on the right side. The right clavicle was also infiltrated and fractured. The sternum seemed free. The dorsal vertebræ were infiltrated. The skull was the seat of several metastases. The other long bones were not examined. The immediate cause of death was terminal pleurisy and broncho-pneumonia.

Histological examination showed in the prostate and in all the metastases a tumor of the carcinoma type, in places carcinoma simplex, in other places definitely of the adenomatous type. In the bones the growth was associated with both bone destruction and bone new formation, and corresponded to the picture so well described by Von Recklinghausen as osteoplastic carcinoma. In the ribs and clavicle the destructive process preponderated, and this had led to the fractures described.

CASE II.—J. G., aged 70. Died in the service of Dr. Van Rensselaer in the Albany Hospital. Clinical history not obtainable.

The autopsy was done fifteen hours after death. The main findings were as follows: The man was much emaciated. There was a double sero-fibrinous pleurisy. The heart showed brown atrophy. The left lung showed pleural tubercles, consolidation with caseation, and congested bronchial mucosa. The right lung showed one caseous area. The bronchial glands were enlarged and showed diffuse caseous areas. The liver showed numerous nodules of new growth, grayish-white in color, from 1 to 2 mm. in diameter. Both adrenals were infiltrated with grayish-white new growth. The spleen showed marked interstitial splenitis with tubercle nodules and areas of new growth. The kidneys showed multiple abscesses and the usual picture of ascending infection. The prostate was enlarged, but was not noted to be abnormal in appearance. The retroperitoneal glands were enlarged and infiltrated with new growth. Most of the ribs, the vertebræ, the iliac bones, and the skull showed areas of infiltration with new growth. The femora were free.

Microscopic examination showed that the prostate was the site of a scirrhus carcinoma in place of the carcinoma simplex type, in other places adenomatous. The bones above-mentioned were

infiltrated with a similar growth which was associated with destruction of bone in some areas and with new formation in others, the typical picture of Von Recklinghausen's osteoplastic carcinoma. The adrenals, retroperitoneal glands, and lungs also contained metastases, and there was a concurrence of tuberculosis and carcinoma in the lesions of the lungs, liver, spleen, adrenals, and the bronchial and retroperitoneal glands.

I have been able to collect from the literature 43 instances[1] of this form of carcinoma, 16 of whieh are reported by Kaufmann. This author's experience shows that if bone metastases are looked for in patients dead of carcinoma of the prostate they will be found in a large percentage of instances. In his own series of 22 cases, in which the bones were properly examined, 70 per cent showed bone metastases, which puts cancer of the prostate far ahead of any other form of new growth so far as this feature is concerned. Hypernephromata give bone metastases in 50 per cent of cases, thyroid tumors in 25 per cent, and breast carcinoma in only 14 per cent. Considering the frequency of prostate carcinoma it is easily realized that many instances of bone metastases must have been overlooked in the past. If bone metastases occur in such a large proportion of cases of carcinoma of the prostate, it is important to know whether the condition can be recognized clinically.

An analysis of the symptoms and signs in 23 patients regarding whom the clinical histories are fairly complete, shows that these cases may be divided into certain types. Symptoms calling attention to the urinary tract may be prominent, or at any rate present, as they were in 13 of the 23 cases, or they may be completely lacking. As far as can be judged there are no symptoms suggesting urinary trouble in approximately one-third of these eases; in one-fifth it is expressly stated that no urinary symptoms were present, in the others they may have oecurred, but were probably so slight as to escape notice.

Of the general symptoms emaciation and weakness were most frequently mentioned. Pain of a general character in all the bones, or more local pain in the back and legs was also eommon. Anæmia was noted in some cases, though there are but few records of blood examinations and most of these show merely a secondary anæmia. The eosinophilia, whieh characterizes some bone tumors, was present only in Braun's patient, whose blood showed a few eosinophilic myelocytes.

Of the urinary signs, an enlarged prostate was noted only in about 50 per cent of the cases. Signs of cystitis occurred in one-fourth of the cases. In fact, the urinary signs may be summarized by stating that when present they were usually those of an enlarged prostate. It is to be noted, however, as a peculiarity of prostate carcinoma, important in these cases, that the gland is often but slightly enlarged, and may even be diminished in size. Clinically evident glandular metastases occurred in a little less than one-fifth of the patients.

As far as the bones are concerned three quite sharply defined groups of cases may be recognized, but more than one type may occur in the same patient:

1. Patients with isolated bone metastases.
2. Patients with spinal metastases causing compression of the cord with spastic paraplegia. (The occasional cranial metastases with hemiplegia might be plaeed with this group.)
3. Patients with diffuse bone metastases giving rise to no external deformity.

The patients with isolated metastases are espeeially interesting to the surgeon, inasmuch as the metastasis has in several instances been taken for a primary growth and has been removed, the true nature of the process later coming to light as the result of histologieal examination of the tumor or of an autopsy. Thus tumors of the frontal bone, the scapula, and the tibia have all been removed surgically as primary growths, and this in some instanees in spite of the fact that the patient had definite symptoms of prostatic disease. In six of the reported cases there were isolated bone metastases; in two instances the pelvic bones were affected, in the other four the femur, the frontal bone, the scapula, and the tibia respectively. There were multiple bone metastases which were clinically apparent in about one-half of the cases. In such cases, of course, the mere multiplicity of the growths should lead one to suspeet that they were not primary.

Those with more or less marked paraplegia numbered 8 out of the 23 cases. In 4 of these the paraplegia was complete and accompanied by the usual sensory changes, the lack of sphincter control, and the exaggerated reflexes. In the other 4 cases the paralysis was ineomplete. In one instance there was a definite dorsal kyphus with the paraplegia, but as a rule no spinal deformity was present. In most instances of this type clinical evidence of involvement of other bones was lacking. In only two patients, one Silcock's and the other reported by Von Recklinghausen, was there cerebral pressure from cranial growths. Silcock's patient had a facial paralysis, whilst Von Recklinghausen's had hemiplegia. Both had mental symptoms, irritability, stupor, and finally coma.

The important symptom of the diffuse form of bone involvement is pain. It may be general, may be most marked in the legs and back, and may present the picture of nerve root pain. It is a pronouneed feature in these patients, is often very severe, may be worse at night, and often requires sedatives. It is sometimes accompanied by stiffness in the back and great aggravation on motion. It may be the only important symptom except the loss of weight and strength and the anæmia. Tenderness is not usual.

Spontaneous fracture of the bones, or fracture after slight injury, is not frequent. It is noted only 5 times in the 43

[1] The case of Wolff is a doubtful one and is not included. The same is true of a case reported in the Westminster Hospital Reports, 1905, XIV, 322. Cruveilhier's case falls under this class clinically but he expressly states that the bones (vertebræ) were normal. Jullien is credited with publishing a case in his article on the prostate in the Nouveau Dictionnaire, but there is no original case in his article; nor is there an original case in the Paris thesis of Julien, 1895, No. 466, who is also credited in the literature. Fraenkel gives no details of his cases and they are not included. My second case is also reported by Moak in his article on the concurrence of carcinoma and tuberculosis. Cone's case is also reported by Young, Johns Hopkins Hosp. Reports, 1906, XIV, 607. Balloch's case was one seen by him with Dr. Thomas C. Smith of Washington, D. C.

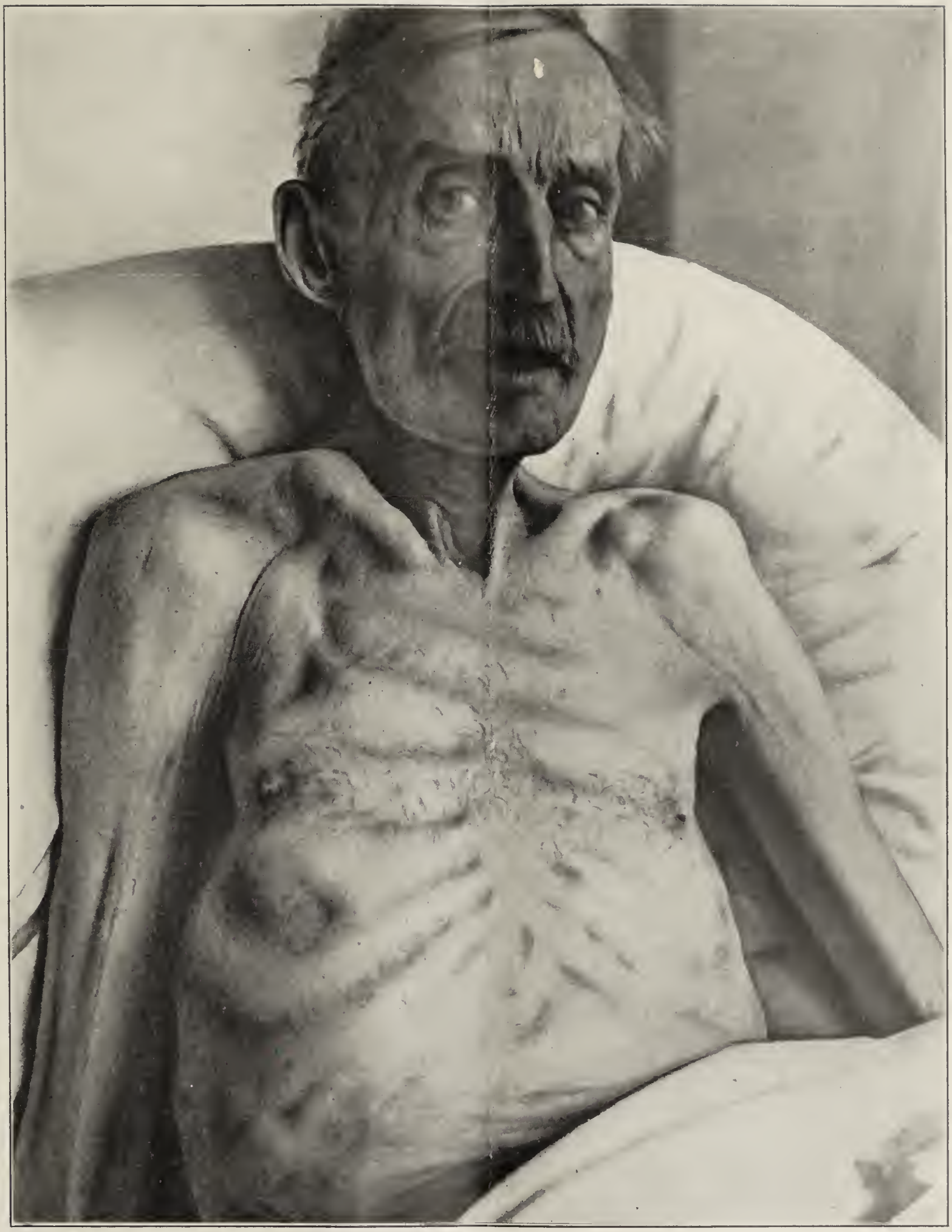


ILLUSTRATION OF CASE II, SHOWING DEFORMITY OF THE CLAVICLE AND OF THE RIGHT SIDE OF THE CHEST.

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cases. The femur, the humerus and the clavicle are the bones usually fractured. My first patient had multiple rib fractures.

The study of the pathological anatomy in this group of cases brings out many points of interest. The comparative infrequency of metastases in the viscera, the urinary bladder excepted, is one of these. This has been overstated, I think, as I found visceral metastases in 17 of the 42 cases, about one-third. The lungs were much more often affected than the other organs, the liver and kidney next in frequency, and the spleen, adrenals, and pancreas rarely. The escape of the spleen, resembling, as it does, the bone marrow in structure, seems remarkable, as Erbslöh notes. The serous cavities were not infrequently the seat of metastases; the pleura 10, the peritoneum 6, the dura 5 times, and the pericardium twice. It is only fair to say, however, that the visceral metastases are generally small and not capable of clinical detection.

Involvement of the lymph nodes was nearly always present, in only 8 of the 42 cases was it missed. The pelvic glands were noted to be the seat of metastases in 15, or a little over one-third of the cases. There was involvement of the glands within the abdomen in 24 cases, and those within the chest in 8 cases. The cervical glands were involved in 4, and the infraclavicular in 3 cases. The glandular involvement, therefore, usually occupied situations not easily accessible to palpation, and in relatively few cases were externally situated nodes enlarged.

The figures regarding bone involvement are open to some inaccuracy, owing to the fact that certain bones are much more likely to be explored on account of their accessibility. This must be taken into account, as must the fact that in many instances of osteoplastic carcinoma there is no external enlargement of the bones to attract the attention of the pathologist, and consequently metastases must have frequently been overlooked simply because they were not looked for. In the 43 cases I have collected the record of bone involvement is as follows:

	Cases.
Vertebræ involved in	35
Ribs involved in	30
Pelvic bones involved in	26
Femur involved in	25
Skull or face involved in	18
Sternum involved in	16
Humerus involved in	15
Tibia involved in	7
Scapula involved in	6
Clavicle involved in	6
Fibula involved in	2
Forearm bones involved in	1

It is apparent from these figures that metastases are most common in the most accessible bones, the femur and humerus accepted, and it must remain more or less of an open question whether the metastases would not have been found to be much more evenly distributed if the less accessible bones had been systematically searched. The metastases tend to occur in those parts of the bones which have the best blood supply, for example, in the proximal parts of the long bones. Histological examination shows that the type of carcinoma has no bearing on the occurrence of bone metastases, that the secondary growths nearly always originate in the medulla, and that the transmission is vascular rather than lymphatic. Secondary growths may originate beneath the periosteum, but this is not usually the case. The marked tendency to bone formation and its usual preponderance over bone destruction is a special feature of this form of bone carcinoma which I shall not especially describe, as it has been extensively discussed by Von Recklinghausen, Cone, Erbslöh, and Fischer-Defoy. Neither shall I discuss the various theories as to why the bones should be the special site of the metastases further than to state that there are two main views, the one supposing that the mechanical peculiarities of the circulation in the bone marrow favor the development and growth of the tumor cells, the other assuming that chemical conditions in the bone marrow are such that this tissue is especially adapted to the growth of cells of prostatic origin.

The results of this investigation may be summarized as follows:

1. Carcinoma of the prostate gives rise to metastases in the bones in a much larger proportion of cases than any other form of carcinoma; probably in at least two-thirds of the patients in whom the disease is allowed to run an unobstructed course.

2. The clinically apparent bone metastases may be single. If occurring in the long or flat bones they may be taken for primary bone tumors and removed as such. If occurring in the vertebræ they frequently give rise to spastic paraplegia.

3. There is a diffuse form of bony involvement without evident deformity of the bones in which intense pain in the bones, often associated with spinal stiffness and accompanied by the general signs of a malignant growth, is the prominent symptom.

4. Symptoms pointing to the urinary tract as the original site of the disease are lacking in perhaps one-third of the patients.

5. In all instances where a male patient, especially one over sixty, presents himself with an apparently primary tumor of a bone or with signs of paraplegia, or with bone pains of obscure origin, a complete examination of the urinary system is indicated, even though no symptoms of urinary disorder be present. Needless to say, the mammary gland, the thyroid, and the region of the adrenals should also be explored.

6. The high percentage of cases of bone metastasis in this form of tumor and the relative rapidity with which it may take place make it imperative that carcinoma of the prostate should be recognized and removed at as early a date as possible.

APPENDIX.

Analysis of the Symptoms and Signs in 24 Patients of Whom a Clinical History is Given.

Age of the patient:

40 to 50	2
50 to 60	5
60 to 70	9
70 to 80	7
Not given	1

Duration of symptoms:

Under 1 year	7
1 to 2 years	6
2 to 3 years	5
3 to 4 years	1
Not given	5

Urinary symptoms:

	Cases.
Absent in	5
Not noted in	4
Present in	15
Enlarged prostate in	11
Retention in	1
Incontinence in	1
Dysuria in	8
Frequent micturition in	6
Pain in	4
Cystitis in	6
Hematuria in	1

Nervous symptoms:

	Cases.
Paraplegia in	8
Hemiplegia in	1
Facial paralysis in	1
Sphincter disturbance in	3
Irritability in	1
Stupor in	1
Coma in	1

General or local pain:

	Cases.
General bone pain in	1
Sciatic pain in	2
Loin pain in	5
Head pain in	1
Back pain in	5
Abdomen pain in	1
Chest pain in	2
Leg pain in	9
Bone tumor pain in	3

Bone changes.

Detectable enlargement in 12 patients:

In the femur in	1
" the frontal bone in	1
" the spine in	1
" the pelvic bones in	2
" the tibia in	1
" the ribs in	1
" the scapula and pelvic bones in	1
" femora and pelvic bones in	1
" legs, feet, and inferior maxilla in	1
" scapula and spine in	1
" ribs, pelvic bones and inferior maxilla in	1

Tenderness of bones in 6 patients.

Spontaneous fracture in 5 patients:

In the femur in	2
" the clavicle in	1
" the clavicle and ribs in	1
" the humerus in	1

Palpable superficial glands in 5 patients:

Inguinal glands in	2
Umbilical glands in	1
Cervical glands in	1
Inguinal, cervical, and subclavicular glands in	1

ANALYSIS OF 42 AUTOPSIES, ESPECIALLY AS TO METASTASES.

Prostate Gland:

	Patients.
Enlarged in	35
Not enlarged in	2
Smaller than normal in	1
Not noted in	4

Visceral metastases noted in 25 patients:

	Cases.
In heart in	1
" pericardium in	2
" lungs in	11
" pleura in	10
" liver in	6
" spleen in	2
" kidney in	5
" adrenal in	2
" dura in	5
" pancreas in	2
" peritoneum in	6
" intestine in	3
" thyroid in	1

Gland metastases noted in 33 patients:

	Cases.
In pelvic glands in	15
" iliac in	8
" inguinal in	6
" abdominal in	25
" thoracic in	12
" cervical in	4
" subclavicular in	3
" axillary in	1
" parotid in	1

Bone metastases noted in all patients:

	Cases.
In vertebræ in	35
" ribs in	30
" pelvic bones in	26
" femur in	25
" skull or face in	18
" sternum in	16
" humerus in	15
" tibia in	7
" scapula in	6
" clavicle in	6
" fibula in	2
" bones of forearm in	1

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RELATIVE AORTIC INCOMPETENCY OF MUSCULAR ORIGIN.*

By JAMES M. ANDERS, M. D., LL. D., Philadelphia.

As far as my experience goes, it would seem probable that relative aortic incompetency of muscular origin is not so infrequent as one is led to suppose from an examination of the literature. The important subject of the relation of cardiac dilatation to that of relative incompetency with its accompanying murmurs, however, is one that is still imperfectly understood. Dombrowski [1] invites attention to the fact, first pointed out by Wolf, that the surface of the mitral leaflets actually exceeds the orifice, and Kirschner and Garcin contend that the anterior flap alone suffices to close the mitral orifice, "even when the heart is considerably dilated."

There are two main categories of cases, which manifest relative aortic incompetency. An interesting and generally well-recognized group is that due to excessive fusiform dilatation of the aorta at its root. A similar condition obtains where an aneurysm of the aorta is situated just above the aortic cusps. Calvert [2] reported a case of acute dilatation of the aorta with double aortic and mitral systolic murmurs. In these instances, the diastolic murmur is occasioned by an eccentric stretching of the aortic ring. While most writers affirm the existence of relative aortic insufficiency of this description without lesions of the aortic valves, a few question its occurrence, *e. g.*, Guttman,[3] Tosenheim,[4] and others. The condition is by no means uncommon, but in the present discussion will be included only those cases belonging to the second group in which neither the segments are the seat of selerosis, nor the walls of the aorta appreciably dilated; or in other words, only cases which are of muscular or neuromuscular origin will be described.

I believe there is ample support for the opinion that imperfect coaptation of the valves, due to defective nutrition, to decided anemia or disturbed innervation even, may cause a diastolic murmur which may or may not prove to be permanent (relative). Again an asthenic condition of the heart muscle, more particularly MacCallum's [5] fourth division or that encircling the left auriculo-ventricular region and the aorta, may produce relative aortic incompetency. Preble [6] states that relative aortic insufficiency is due to dilatation of the heart wall, and also that the diastolic murmur is occasionally produced by inflammation of the aorta. Aortitis, a subject which cannot receive extended consideration here, occurs more frequently in older subjects and as the disease progresses, the murmur is apt to disappear. Here it should be pointed out that a diastolic murmur due to overstretching of the aortic ring, from the presence of an aneurysm situated just above the orifice, may also absent itself at varying intervals of time.

I have observed that disappearance of the murmur may coincide with periods of absolute rest, while, *per contra,* increased activity of the circulation, the result of mental excitement and physical exertion, tends to reproduce the murmur for the reason presumably that the distending force within the sac is thereby increased. In the same category belong the cases due to high pressure in the aorta opposed to slightly diseased segments. These two last named varieties of aortic incompetency can be readily separated clinically from the myocardial form which is under discussion, by a consideration of the associated conditions and their etiologic significance.

In a paper on "Relative Insufficiency of Pulmonary Valves," Preble [7] has called attention to the anatomic and functional similarity of the aortic and pulmonary valves. Preble found six cases of the latter condition supported by autopsy, to which he added the report of a seventh from Herrick's ward in the Cook County Hospital.

Bramwell [8] claims that relative aortic incompetence is never muscular. Edwards,[9] however, has reported a case in which chronic fibrous myocarditis was present without valvular changes. The condition is also referable to still other degenerative lesions of the myocardium of the left ventricle. This view, which is extensively supported by clinical and post-mortem observations, as will be shown hereafter, is also corroborated by convincing experimental evidence. Thayer and MacCallum [10] produced artificially a loud diastolic murmur in the dog in eight instances; "this murmur sometimes replaced the second sound; sometimes the two sounds were heard in association." The character, seat of maximum intensity and area of transmission of these experimentally induced murmurs were similar to what is observed in aortic incompetency in man.

Thayer and MacCallum say further that, "The most interesting points brought out by these cases of aortic insufficiency would seem to be the intensity of the diastolic murmur at the ring, and its feebleness over the aorta above and over the right and left ventricles below, a condition in every way analogous to that observed in the human heart, and wholly in accordance with the well-known fact that the murmurs of aortic insufficiency are often very difficult to hear. Especially interesting was the production of a functional aortic insufficiency from dilatation, an observation supporting entirely the conception of those observers who have insisted upon the important part which the muscle of the left ventricle plays in the closure of the aortic ring."

Cases of relative aortic incompetency due to the toxic action

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[1] Rev. de méd., Sept. 10, 1893.

[2] Interstate M. J., 1906, Vol. XIII, p. 237.

[3] Ztschr. f. klin. Med., 1883, Band VI, 131.

[4] Von Ziemsen: Handbuch d. spec. Pathologie.

[5] Wood's Reference Handbook of the Medical Sciences, Vol. IV, pp. 378-379.

[6] Memphis M. J., February, 1903, XXIII, p. 104.

[7] Loc. cit.

[8] Diseases of the Heart and Thoracic Aorta, p. 418.

[9] Am. J. M. Sc., October, 1908.

[10] Am. J. M. Sc., February, 1907.

of bacterial poisons on the eardiac muscles in the course of certain acute infectious diseases, *e. g.*, rheumatism, influenza, diphtheria, and pneumonia, may also occur, though rarely. It is of more than passing practical importance to note the ease of the dilatation when it arises under these circumstanees for therapeutic and hygienic reasons. Lees,[11] Robinson[12] and others have enlarged upon this thought in the past, and the latter further invites attention to aeute cardiae dilatation of nervous origin, giving rise to temporary systolic and diastolic murmurs.

While in this form of aortie ineompetency the murmur may disappear as the result of marked improvement in the size and aetion of the heart in consequenee of appropriate treatment, it is to be recolleeted that the diastolie murmur may also disappear when acute failure of the left ventricle supervenes in the course of the usual type in which degenerative changes in the segments oecur. Obviously, the theme of our inquiry does not embraee the latter class. The pulse, it should be noted, is less eollapsible in the variety of relative aortic incompetency under discussion, *i. e.*, muscular incompeteney, and hypertrophy of the left ventriele is also less pronounced in some eases than in true aortie regurgitation due to chronie valvulitis. Dilatation of the left ventricle, however, may be of marked extent. The murmur of relative insuffieiency is of unusual intensity and of musical quality (Groedel, Von Leube and others).

Museular incompeteney may also arise secondary to primary chronic valvulitis affecting the mitral segments during the stage of noncompensation. When extreme dilatation follows on mitral valve disease, there are two principal types of myoeardial changes present—to wit: general fibroid and fatty degeneration.

Charles Lyman Greene[13] has directed attention to the importance of a modified second carotid tone as a concomitant of aortic regurgitation, and reeords cases in which the diastolic murmur was present temporarily, the second carotid being either inaudible or scareely heard. On the other hand, murmurs of relative insufficieney, to which especial attention is directed in this paper, may be attended with a fair degree of carotid tone (as in Case II of my series, *vide infra*) in eases in which the valves are healthy, but slightly incompetent owing to an overstretched aortie ring.

I shall here quote from illustrative cases, and subsequently eonsider further the principal questions involved.

Case 1.—W. J. H., æt. 27 years, a physician; height, 5 feet, 2 inches; weight, 118 lbs.

Family History.—Both parents living, mother has been dyspeptic for ten years; father subject to epilepsy from the age of 23 to 33 years, then attacks disappeared (without operation); maternal grandmother has carcinoma of face.

Previous History.—Patient had the usual childish diseases; at ten years of age, had typhoid fever and at 21 years eczema, while two years since suffered from acute indigestion for a few days.

Social History.—Single, has given careful attention to diet, uses neither tobacco nor alcoholic intoxicants of any sort; on account of a large obstetric practice, the patient has been subjected to physical overstrain.

Present Illness.—This began about one month before he consulted me with gastric symptoms, discomfort, more particularly after food, distention of stomach by gas and troublesome palpitation with general nervousness at night. The patient is decidedly neurasthenic.

The physical signs reveal typical aortic regurgitation at an early stage, there being but little hypertrophy present, although evidence of a considerable degree of dilatation exists. There is arrhythmia as shown by abnormalities of both rhythm and volume of the radial pulse, which is full, although less collapsible than in typical aortic incompetency. The murmur is best heard at the inner end of the second right intercostal space, is rather loud, and is transmitted in the usual direction. The capillary pulse and throbbing vessels, so characteristic of this lesion, are both present. The blood pressure is 132 systolic and 120 diastolic, as a rule.

Examination of the urine and blood gave negative results. The treatment embraced careful regulation of the diet (the carbohydrates and saccharine substances being minimized), an increased number of hours for rest, and the use of small doses of digitalis, spartein sulphate, arsenic and strychnin in combination. As the result of this method of treatment, a slow and gradual improvement in the general condition supervened; the murmur became less pronounced in the course of six months, and reached the vanishing point at the end of one year. The absence of the diastolic murmur in this instance was at first temporary, but since taking two courses of the Schott treatment, one at Glen Springs, New York, and the other more recently, at Bad Nauheim, in connection with the measures previously adopted, it has not been audible during the past year and a half. The heart as shown by a physical examination is of about normal outline or size, and the usual secondary accompaniments of aortic regurgitation have also disappeared. A pulse-tracing taken November 10, 1908, shows definitely that all arterial evidence of the disease has been removed.

Case II.—Dr. H. L., æt. 44; weight, 135; height, 5 feet, 7 inches; father died of pernicious anemia at 65, mother of arteriosclerosis and nephritis at the age of 70. Among paternal uncles and aunts, rheumatism, apoplexy and nervous complaints prevailed. The patient had the usual diseases of childhood, including scarlatina; also repeated convulsions during the first four years of life. At the age of 17, and again at 18, had inflammatory rheumatism followed by a mitral lesion.

The social history furnishes the following points: Married, no children, physician by occupation for many years, during which time his habits as to eating and sleeping were most irregular; does not use alcohol, but tea and coffee to a moderate extent.

During the second attack of acute articular rheumatism, a mitral regurgitant lesion was discovered and the compensation remained uniformly good until six years ago, when it was lost as the result of repeated attacks of *la grippe*. Mental worry and exposure to inclement weather were probably contributory causes.

On admission, March 10, 1908, the patient exhibited marked dyspnœa with a sense of suffocation in paroxysms, and marked edema of the legs and thighs. The physical signs were those of combined mitral and tricuspid incompetency, the latter being attributed to relative insufficiency. Additionally, both in the carotid area and from the inner end of the second right interspace, downward along the left edge of the sternum, and outward to a point beyond the left mid-clavicular line, could be distinctly heard a diastolic murmur, moderately harsh and blowing in quality. On making an X-ray examination, the cardiac shadow

[11] Acute Visceral Inflammations, London, 1904, p. 296.
[12] Am. J. M. Sc., February, 1907.
[13] Archives of Diagnosis, April, 1908.

was found to extend practically from one side of the chest to the other.

The blood pressure was 125 systolic and 100 diastolic. The urinary analysis showed a heavy ring of albumin, a faint reaction for indican, and an excessively large number of broad hyaline and finely granular casts.

During the next four months, the patient's condition fluctuated considerably with, however, a downward tendency toward the grave, and on June 5, 1908, gangrene affecting the lower extremities supervened and carried off the patient in the course of three days. It should be stated that the diastolic murmur disappeared about two weeks prior to the fatal termination.

The post-mortem findings embraced the following points: The heart when removed weighed 790 grams. The ventricles, more

CASE III.—D. B., æt. 58, white, native of Russia; father died at the age of 75, but cause not known; mother died suddenly at the age of 90, had been suffering from shortness of breath all her life. Four sisters living, and well, no brothers. All members of his paternal family died comparatively young, although as far as he knows they did not suffer from any hereditary diseases. On his maternal side, they all lived to an old age. Occupation until eight years ago was that of a presser; since then he has not done anything. Married, and a father of two children; youngest being eight years old. Uses tea and coffee freely diluted and sparingly; alcohol moderately; smokes four to six cigarettes daily, and does not pay any attention to diet or exercise; no venereal disease.

Previous History.—Thinks that he has had childhood's diseases.

REPORTER.	DIASTOLIC MURMUR AND ITS VAGARIES.	ASSOCIATED MURMURS.	CLINICAL PECULIARITIES.	POST-MORTEM FINDINGS.	CAUSES.
Jaccoud[1]	Permanent	Mitral systolic		Dilatation of left ventricle due to synechia cordis; relative aortic and mitral regurgitation; valve leaflets normal.	Dilatation of left ventricle.
Peacock[2]	Not heard, due to asystole.	None	Rheumatic fever fourteen years previously; marked dyspnœa; edema present a few days before death; almost pulseless; arrhythmia.	Heart markedly dilated, especially left ventricle; all orifices increased in size; aortic valves and aorta healthy; mitral leaflets healthy, but incompetent.	Dilatation of left ventricle from failure of muscular power.
Litten[3]	Transitory murmur at the aortic area, but repeatedly disappearing after rest.	None	The secondary manifestations of aortic regurgitation with hypertrophy of left ventricle.		Of ventricular origin(?).
Edwards[4]	Permanent	None	Quincke's capillary pulse absent.	Valves normal; hypertrophy and dilatation of left ventricle; chronic fibrous myocarditis caused by sclerosis and thrombosis of coronary arteries.	Hypertrophy and dilatation of left ventricle.
Pitt[5]	Permanent	None		Early atheroma of aorta; aortic valves normal, but incompetent because of stretching; left ventricle greatly dilated and hypertrophied.	Dilatation of left ventricle.
Willson[6]	Permanent	Mitral systolic and presystolic; pulmonary and aortic systolic.	Previous attacks of inflammatory rheumatism, pericarditis (affecting mitral leaflets); complained of precordial pain; angina pectoris.	Heart enormously hypertrophied with dilatation; aorta slightly thickened; aortic leaflets normal; mitral orifice admits three fingers; its leaflets show slight puckering and thickening.	Marked hypertrophy with dilatation, especially of left ventricle.
Hamilton[7] and Byers.	Appeared seven days before, and persisted until, death.	Soft systolic at apex—not transmitted; loud pulmonic systolic.	Profound secondary anemia; arteriosclerosis; emphysema; cystitis, due to polypoid growth.	Heart dilated with some hypertrophy of the left ventricle; aorta not dilated; valves normal and competent; slight atheroma of aorta.	Myocardial weakness, especially of bundle around auriculo-ventricular orifice and aorta.
Cautley[8]	Persisted for 26 days, with exception of 3 days; disappeared gradually, reappeared during attacks of mumps.	Mitral systolic	Followed acute rheumatism; pericarditis with effusion; recovery practically complete.		Dilatation of heart, probably due to myocarditis.

[1] Gaz. hebd. de méd., 1861, VIII p. 50.
[2] Tr. Path. Soc. Lond., 1862, XIII, p. 64.
[3] Deutsche med. Wehnschr., 1887, XI, p. 42.
[4] Am. J. M. Sc., October, 1895, p. 438.
[5] Tr. Path. So. Lond., 1898. XLIX, p. 46.
[6] Proc. Path. So. Phila., 1899, II, p. 81.
[7] Am. J. M. Sc., October, 1903, p. 671.
[8] Polyclin., Phila., March, 1907, XI, p. 42.

particularly the left, showed hypertrophy associated with a moderate degree of dilatation. Both the right and left auricles were much dilated, the left enormously so with exceedingly thin walls. With the exception of a few atheromatous patches, the aorta and pulmonary artery were normal. Macroscopically, the aortic segments were normal, and the aortic ring was of about normal or slightly increased dimensions. On the other hand, the mitral leaflets were very much thickened and sclerosed, containing several calcareous deposits; these valves were markedly incompetent. Neither the tricuspid nor pulmonary artery valves showed any organic changes. The pericardium was somewhat roughened and the sac contained considerable serous fluid.

Dr. Edward M. L'Engle made a microscopic study of the aorta, the semilunar segments and myocardium near to the valve, and reported negative findings, excepting that the muscular structure showed a slight degree of brown atrophy and increased connective tissue.

Suffered from scrofula and eczema until his 20th year, and from intestinal worms until his 30th year. When he first arrived here (30 years ago) he developed eczema on his legs; this persisted for only three months, and he has never had a rash since; several attacks of *la grippe*. Since childhood has had sudden attacks of syncope which lasted but a moment; these come on very frequently now—four or five times daily—and last much longer.

Present Illness.—Eight or nine years ago while walking on the street, he collapsed, was taken home and a physician called, who told him that he had heart disease. First came to the dispensary of the M. C. H. seven years ago when his disease was diagnosticated as mitral regurgitation. The patient has been under the care of Dr. Loewenberg since 1903, suffering from mitral insufficiency. In the autumn of 1905, he met with an accident (in a collision of cars); he was taken home in a semiconscious condition. On the day after the accident, Dr. Loewenberg discovered a distant murmur at the second aortic cartilage, diastolic in time

and transmitted downwards. That murmur persisted for nearly four weeks and then disappeared.

In February, 1907, he had an attack of constipation (paresis of bowel), following which attack, he again presented the aortic regurgitant murmur with symptoms of failure of compensation. At this time there were several other murmurs, a mitral stenotic, and surely a mitral regurgitant, and also a hemic. Since then the patient has been constantly kept on cardiac stimulants and when they have been withdrawn for three or four weeks, the aortic murmur has returned with signs of failure of compensation. The mitral regurgitant murmur was always present with the aortic diastolic murmur.

Blood pressure, systolic 142; diastolic could not be gotten. Urine negative as to albumin (except during periods of lost compensation), casts and glucose; a few epithelial cells, and a moderate amount of uric acid crystals were present.

It is interesting to note that the diastolic murmur in Cases II and III was due to mitral disease followed by failure of the left ventricle. This bruit, however, disappeared in Case II, with the development of extreme asystole, while in Case III such disappearance coincided with a diminution in the cardiac dilatation, and increased vigor of the myocardium as the result of treatment by cardiac stimulants.

The accompanying table includes a tabular statement of eight cases gleaned from the general literature. These, added to those herewith reported, make a total of 11 cases.

General Remarks.—Case I of my series was most probably an instance of relative incompetency of muscular and nervous origin without organic changes of any of the valve segments. In Cases II and III, the temporary aortic insufficiency was secondary to mitral incompetency due to chronic valvulitis. It is when the systolic mitral becomes soft and whiffing with rapid, feeble heart and increased dyspnœa, that the left ventricle is laboring and a diastolic aortic murmur becomes audible. Later still in the course of mitral disease, the diastolic aortic may, as stated above, disappear, in consequence of oncoming asystole. It can also be easily demonstrated that with improvement in the myocardial strength as the result of treatment whereby the dilatation is overcome, the aortic regurgitant murmur may disappear.

While these are instances in which relative aortic insufficiency supervenes in the course of chronic endocarditis affecting the mitral valves, it is well known that where these two murmurs are combined, the mitral systolic is in the majority of instances secondary to primary sclerotic endocarditis affecting the aortic segments. The possibility, however, in cases in which this association of murmurs is met with, of the existence of primary mitral disease, followed by relative aortic incompetency, should be, in view of the above cases, recollected.

Of the eight cases included in the above table, four showed organic changes in the mitral cusps at necropsy, while the aortic valves were apparently normal (and this was also true of Case II of my series), and the explanation of these cases of relative aortic incompetency may be reasonably thought to be dependent upon marked left ventricle dilatation after failure of compensation in the course of organic mitral incompetency with its classical murmur. These examples of relative aortic insufficiency confirm the independent observations in Cases II and III of my series. Now, while searching the literature, 21 cases were encountered in which the necropsy showed both left ventricle dilatation and morbid changes with more or less dilatation of the root of the aorta. It is not improbable that here the condition of the left ventricle also shares in the production of the relative aortic incompetency, but I have excluded all examples of the sort from the above tabular list of recorded cases.

Not only eccentric stretching of the aortic ring may result from dilatation of the left ventricle, but also a similar stretching of the root of the aorta, more particularly if it has been previously diseased—an ascending process. In other cases, the distending force is most probably exerted both within the aorta and the left ventricle simultaneously. At all events, it is not improbable that in cases in which dilatation of both the left ventricle and the root of the aorta is met with post mortem, the ventricular condition may have shared in the causation of the enlargement of the aortic orifice.

It is quite true that in cases in which no post mortem evidence is obtainable, other causes than myocardial weakness and dilatation may have been operative. On the other hand, the instances that came to necropsy place the possibility of a purely myocarditic origin of aortic incompetency beyond all doubt. Dilatation of the left ventricle should be taken into account in any effort to decide the cause of aortic diastolic murmurs when such dilatation is associated with other causative lesions. It may be stated here parenthetically that the converse is found in stenosis of this orifice due to "narrowing of the left ventricle immediately below the level of the valve, which is little if at all affected."

While the murmurs due to relative incompetency may, as already pointed out, disappear either when the left ventricle becomes extremely weak or in cases in which the dilatation bearing a causative relation to the murmur has been overcome as the result of appropriate treatment, it is important to separate these, as I have attempted to do above, from the organic murmurs, since the latter may likewise absent themselves either temporarily or permanently. Boyd refers to a case of the sort in which an aortic diastolic murmur was missing for two years after its detection in consequence of an attack of acute rheumatism. Greene reports cases met with in their incipiency with disappearance of the murmur. Saundby and Musser have reported instances of mutability and disappearance of organic murmurs originating at the aortic orifice. Indeed, as Strümpell observed, the murmur may be absent throughout the long course of the disease. Poynton asserts that in some cases, in which mitral and aortic lesions are combined, the latter may be slight and even disappear. He also calls attention to post-mortem investigations in which the aortic valves have been found to be slightly damaged and yet during life there has been no suspicion of aortic disease.

In the presence of the incipient lesions of aortic regurgitation, then, the murmur may display vagaries somewhat similar to those of functional origin, becoming continuous at a later date in a certain proportion of cases, at least, especially when

progressive degenerative changes in the aorta and valve segments are associated. One point, however, may be here emphasized, namely, that the aortic diastolic of organic origin is probably the most constant among the classical murmurs. At all events, if we except intercurrent acute infections which may cause its temporary disappearance, just as in the case of other organic murmurs, the preceding statement is doubtless correct.

Cases are also reported by Litten, Duroziez, Gerhardt, Von Leube and others, in which accidental diastolic murmurs were heard over the upper and mid-sternal regions, which murmurs were ascribed either to "*Sehnenflecken*" on the pericardium or originating in the veins, *e. g.*, subclavian, inferior vena cava. Some of the latter grow in intensity as we pass downward toward the lower sternal region, while others become more and more pronounced as the bell of the stethoscope is moved upward to the cervical vessels.

The *bruit de diable* may give rise to confusion, but if it be recollected that venous sounds have a different quality, become louder during inspiration, are not strictly synchronous with the second tone, and that the latter can be clearly heard to accompany the former adventitious sound, error can be avoided.

In conclusion, based upon my own studies and the observations of others, the cases of muscular relative incompetency at the aortic orifice may be placed in three well-defined divisions: (a) Cases of muscular and nervous origin that supervene in the course of fibrous myocarditis and other less serious conditions of the myocardium, independently of valvulitis or advanced organic changes in the aorta; (b) cases secondary to chronic valvulitis affecting the mitral segments with failure of the left ventricle, and (c) cases occurring in the course of or following acute infective diseases due to the action of the toxins upon the myocardium. Cases of purely nervous origin may also be met with occasionally.

There are on record a sufficient number of examples of relative incompetency of muscular origin to form a sub-class that should be more generally recognized than it has been in the past both for therapeutic and prognostic reasons. As in Case I of my series, the dilatation on which the murmur depends is not necessarily progressive and fatal, and apparent recovery may occur as in that instance. It is quite possible, indeed presumable, that toxic effects upon the myocardium may greatly diminish the contractile power of the heart, thus leading to muscular incompetency without producing detectable histologic changes. Persistent rest and the judicious use of remedies and eliminative measures will sometimes suffice to overcome the dilatation in these cases. In each of the first and third group of cases described above, the soft systolic mitral makes its appearance more frequently than the diastolic aortic. Obviously, additional illustrations of the sort of cases here narrated are needed.

Finally, the principal object of this paper is to show that functional incompetency of the aortic segments due to dilatation of the left ventricle is not sufficiently recognized.

Discussion by Dr. Hugh A. Stewart.

I think there can be no question that a transient aortic insufficiency is a clinical possibility. The cases which have been cited by Dr. Anders are in themselves sufficient to convince the most sceptical. At the same time there is one condition with which this may be confounded, and it may not be unprofitable to refer to it briefly. This condition is a transient pulmonary insufficiency. Notwithstanding the precision of auscultation as a method of physical diagnosis, the distinction, in the absence of other signs and symptoms, between a pulmonary and an aortic diastolic murmur is still a matter of some uncertainty. Several years ago Gibson pointed out that a relative pulmonary insufficiency is by no means the rare condition which we are sometimes inclined to regard it. He was able to show experimentally that a rise of pressure in the pulmonary system may give rise to a dilatation of the conus arteriosus and a consequent mal-adaptation of the pulmonary cusps. Such a rise in pulmonary pressure, it is conceivable, may arise in many disturbances of the circulation, and, in view of the possibility of such a development, it might be contended that in those cases in which we have a transient diastolic murmur at the base of the heart, the seat of origin may be the pulmonic and not the aortic orifice. This, to my mind, is a most potent objection, for the identification of a murmur from its point of maximum intensity alone may be the cause of serious error. An aortic diastolic murmur may be heard loudest at the left side of the manubrium sterni, but it also may be heard best to the right side, *viz.*, over the pulmonary area. From the points of maximum intensity alone, therefore, it may be impossible to distinguish between the two, and it must be recalled that we may have an aortic insufficiency without any other sign or symptom—such as a Corrigan pulse or capillary pulsation. We have at the base of the heart two orifices, the aortic and the pulmonary, the former surrounded by a large mass of muscular tissue, the latter by only a few narrow strands. An evanescent diastolic murmur arises which from its position may be referable to either orifice. This murmur can have a causation only in muscular hypotonicity, and since a pulmonary insufficiency is so easy of experimental production and possesses so scanty a surrounding of muscle tissue, it is most natural to infer that such a transient murmur must arise from the pulmonic orifice unless we can prove experimentally that an impairment of the musculature surrounding the aortic orifice will permit of the development of a true aortic insufficiency. In 1904 J. B. MacCallum described in detail a band of muscular fibers, which, unlike the majority of the fibers of the heart, are confined entirely to one ventricle, and which constitute in great part the opening of the ventricle towards the aorta. It can be shown that this band of muscle differs in its mode of action and contraction from the other muscular strands in the ventricle. Its action is sphincter-like and its contraction partly diastolic. Its function undoubtedly is to aid the semilunar valves in the complete closure of the mouth of the aorta. In view of this fact we would, *a priori*, seek an

explanation of a transient aortic insufficiency in an impairment of the action of this muscle—the Aortic Ring Muscle, so-called. It can readily be shown that this assumption is justifiable, for if we expose the heart of an animal and insert a fine curved knife through the wall of the ventricle so as to divide the muscle without injuring in any way the aortic cusps, a diastolic murmur of aortic insufficiency will at once become audible. It seems to me, then, that we have in this abundant proof in the first place that the Ring Muscle is a factor in the complete closure of the aortic orifice, and that this muscle may, under pathological conditions such as Dr. Anders has described, fail to exercise this function completely, and so give rise to an aortic insufficiency without organic change in the aortic cusps.

OLD-TIME MEDICAL EDUCATION.*

By James J. Walsh, M. D., New York,

Dean and Professor of The History of Medicine and of Nervous Diseases at Fordham University School of Medicine, New York, N. Y.

We are so accustomed to think that what we are doing in medical education is so far ahead of anything that was accomplished in the past and especially in the far distant past, that to suggest that some of the medical schools of six or seven centuries ago did work quite as good as ours and perhaps even better than ours would seem like a cardinal heresy. After all "we are heirs of all the ages in the foremost files of time" and it would seem utterly impossible that we had not advanced in nearly seven centuries. Someone said that the nineteenth century would almost surely be stamped in history as the century of evolution. The idea of evolution has become so ingrained in all our thinking that none of us can possibly credit for a moment that men are not making great advances which can be measured almost by decades. To say that we were not advancing from century to century, and that even after five centuries there is very little of progress in a great scientific department must of course then be a shock to most people.

As a rule, the less one knows about the past the more one is sure that the present represents great progress over what has been accomplished. When I hear a man talking of the wonderful progress that we are making in every line of human accomplishment then I always conclude that he does not know any but the history of his own generation, and very little of that, with some vague generalities about the past. It is mighty easy in that case to talk about evolution and progress, but when one knows sufficient about the past, then progress becomes a very difficult thing to prove. Flinders Petrie, probably the greatest of living Egyptologists, to whom we owe nearly a thousand years of Egyptian history before 4000 B. C., declares that men have not advanced in their power to design art work or decorations or to make jewels of various kinds, and their endeavor to correct social abuses and the laws they drew up show that the human intellect does its work now after 6000 years just as it did in Egypt in the long ago. The sayings of Ptah-Hotep, our first book, show us that a father could give advice to his son about as well 6000 years ago with regard to the dangers of life and how to get along amid them as old Polonius in Shakespeare or as the wisest of fathers now.

There is of course no question of progress or evolution in literature. The great literary men are phenomena that occur at irregular intervals and the three greatest of them whose names are worthy to be mentioned in the same breath, while all others fall far below them, come in times and climes and countries far distant. Homer and Dante and Shakespeare are not in any course of evolution that we can think of. The same thing is true for art. Whether we consider architecture or sculpture or painting or decoration, the great nations of antiquity have done quite as well as any modern time, and, indeed, at the present moment we are far below what was accomplished in these lines at half a dozen different periods in the world's history. It is supposed, however, that in science there is a great advance. Anyone who knows well what was done at the Museum of Alexandria, that first great university of human history is not likely to take boasting about our advance in science any too seriously. That one university gave us the work of Ptolemy in astronomy which lasted for nearly 1500 years, of Archimedes in physics, representing some of the best of its kind ever done, Euclid in geometry in the form in which we still study it, and a great deal of work in the biological sciences, notably in human anatomy and in comparative anatomy. We have accumulated information since then, but we have not improved in methods nor in achievement so far as they took up problems seriously.

The more one knows about the past the less one thinks about the present. Of course it would seem very clear that in medicine, and, above all, in medical education, we far surpassed the generations of six and seven centuries ago, but for curiosity's sake it is worth while to make the comparison deliberately. When we began our work at the new Medical School at Fordham we realized that if we would attract attention we must do something that other medical schools were not doing. You know very well how hard it is to find something in medicine that Johns Hopkins is not doing. That was the problem we had before us. It seemed as though old-time medical history might represent the promising field in this direction—not that you had not paid attention to it, but that you had not specialized in it. We have turned up some of the old laws and the charters of the University Medical Schools and the lives of the old professors, and that is what I am going to talk about to you this evening. It is the offering of the newest of the University Medical Schools to that medical school which has done most to replace the medical school in this country in its proper position of a university department doing post-graduate work.

There is only one way in which the story of the past can be

* Paper read at a meeting of the Johns Hopkins Historical Club, February 8, 1909.

really read with assurance, and that is through its documents. If one wants to know what the medical education of a particular time was, find out what were the laws regulating the practice of medicine and the charter requirements of the medical schools. Fortunately some of the old-time laws and charters are not difficult to get at and so we can get a good idea of the status of the physician and of medical education six centuries ago. There is a law of the Emperor Frederick II, which is indeed startling to modern complacency. It requires four years of medical study after three years of preliminary study in the university, and then a year of practice with a physician before the young doctor may practice for himself. This law is dated 1241. When we recall what we were doing here in America in 1841, six centuries later, the comparison is rather odious. We asked two terms of 16 weeks each, though I believe they were maintaining *high* standards in some of the largest cities and demanded 20 weeks of attendance. A man might come to the medical school from the farm or the smithy, or the mines, or before the mast, and if he could write his name he was allowed to study medicine and did not find it hard to graduate. At the end of two brief terms, 32 weeks of lectures in all, he was given his degree as a doctor, the license to practice, which was in every State in the Union a license to practice not medicine, the Lord knows, but to practice on his patients until he learned some medicine.

Here is the old-time law as it is to be found in the collection of the laws of Frederick II, though I have taken it from von Töply's[1] "Studies in the History of Anatomy in the Middle Ages." I translated the law for the *Journal of the American Medical Association* some time ago, and quote it from there:

While we are bent on making regulations for the common weal of our loyal subjects we keep ever under our observation the health of the individual. In consideration of the serious damage and the irreparable suffering which may occur as a consequence of the inexperience of physicians, we decree that in future no one who claims the title of physician shall exercise the art of healing or dare to treat the ailing, except such as have beforehand in our University of Salerno passed a public examination under a regular teacher of medicine and been given a certificate, not only by the professor of medicine, but also by one of our civil officials, which declares his trustworthiness of character and sufficiency of knowledge. This document must be presented to us, or in our absence from the kingdom, to the person who remains behind in our stead in the kingdom, and must be followed by the obtaining of a license to practise medicine either from us or from our representative aforesaid. Violation of this law is to be punished by confiscation of goods and a year in prison for all those who in future dare to practise medicine without such permission from our authority.

Since the students can not be expected to learn medical science unless they have previously been grounded in logic, we further decree that no one be permitted to take up the study of medical science without beforehand having devoted at least three full years to the study of logic. After three years devoted to these studies he (the student) may, if he will, proceed to the study of medicine, provided always that during the prescribed time he devotes himself also to surgery, which is a part of medicine. After this, and not before, will he be given the license to practise, provided he has passed an examination, in legal form, as well as obtained a certificate from his teacher as to his studies in the preceding time. After having spent five years in study he shall not practise medicine until he has during a full year devoted himself to medical practice with advice and under the direction of an experienced physician. In the medical schools the professors shall during these five years devote themselves to the recognised books, both those of Hippocrates as well as those of Galen, and shall teach not only theoretic but also practical medicine.

We also decree as a measure intended for the furtherance of public health that no surgeon shall be allowed to practise, unless he has a written certificate, which he must present to the professor in the medical faculty, stating that he has spent at least a year at that part of medicine which is necessary as a guide to the practice of surgery, and that, above all, he has learned the anatomy of the human body at the medical school, and is fully equipped in this department of medicine, without which neither operations of any kind can be undertaken with success nor fractures be properly treated.

In every province of our kingdom which is under our legal authority, we decree that two prudent and trustworthy men whose names must be sent to our court, shall be appointed and bound by formal oath, under whose inspection electuaries and syrups and other medicines be prepared according to law and be sold only after such inspection. In Salerno in particular we decree that this inspectorship shall be limited to those who have taken their degree as masters in physic.

We also decree by the present law that no one in the kingdom except in Salerno or in Naples [in which were the two universities of the kingdom] shall undertake to give lectures on medicine or surgery, or presume to assume the name of teacher, unless he shall have been very thoroughly examined in the presence of a government official and of a professor in the art of medicine. [No setting up of medical schools without the proper authority.]

Every physician given a license to practise must take an oath that he shall faithfully fulfill all the requirements of the law, and in addition that whenever it comes to his knowledge that any apothecary has for sale drugs that are of less than normal strength, that he shall report him to the court, and besides that he shall give his advice to the poor without asking for any compensation. A physician shall visit his patient at least twice a day and at the wish of his patient once also at night, and shall charge him, in case the visit does not require him to go out of the village or beyond the walls of the city, not more than one-half tarrene in gold for each day's service.[2] From a patient whom he visits outside of the village or the wall of the town, he has a right to demand for a day's service not more than three tarrenes, to which may be added, however, his expenses, provided that he does not demand more than four tarrenes altogether.

He (the regularly licensed physician) must not enter into any business relations with the apothecary nor must he take any of them under his protection nor incur any money obligations in their regard.[3] Nor must any licensed physician keep an apothecary's shop himself. Apothecaries must conduct their business

[1] "Studien zur Geschichte der Anatomie im Mittelalter, Robert Ritter von Töply. Leipzig und Wien, Franz Deuticke, 1898.

[2] A tarrenus or tarrene in gold was equal to about thirty cents of our money. Money at that time had from ten to fifteen times the purchasing power that it has at the present time. An ordinary workman at this time in England received about four pence a day, which was just the price of a pair of shoes, while a fat goose could be bought for two and a half pence, a sheep for one shilling two pence, a fat hog for three shillings, and a stall-fed ox for 16 shillings (Act of Edward III. fixing prices).

[3] Apparently many different ways of getting round this regulation had already been invented, and the idea of these expressions seems to be to make it very clear in the law that any such business relationship, no matter what the excuse or the method of it, is forbidden.

with a certificate from a physician according to the regulations and on their own credit and responsibility, and they shall not be permitted to sell their products without having taken an oath that all their drugs have been prepared in the prescribed form, without any fraud. The apothecary may derive the following profits from his sales: Such extracts and simples as he need not keep in stock for more than a year, before they may be employed, may be charged for at the rate of three tarrenes an ounce.[4] Other medicines, however, which in consequence of the special conditions required for their preparation or for any other reason, the apothecary has to have in stock for more than a year, he may charge for at the rate of six tarrenes an ounce. Stations for the preparation of medicines may not be located anywhere but only in certain communities in the kingdom as we prescribe below.

We decree also that the growers of plants meant for medical purpose shall be bound by a solemn oath that they shall prepare their medicines conscientiously according to the rules of their art, and so far as it is humanly possible that they shall prepare them in the presence of the inspectors. Violations of this law shall be punished by the confiscation of their movable goods. If the inspectors, however, to whose fidelity to duty the keeping of the regulations is committed, should allow any fraud in the matters that are entrusted to them, they shall be condemned to punishment by death.[5]

Of course it will be thought that this law was an exception. Frederick II is one of the greatest men in history, and he might easily have reached a great expression of law-giving with regard to medical education and practice that would anticipate progress for many centuries. There is no reason, however, to consider that this is so, since we have other documents which show that what Frederick made into a law for the Two Sicilies was expressed in various papal documents, the charters of universities of that early time. There are two or three Bulls of Pope John XXII founding medical schools in connection with the universities already existing that show exactly the same requirements as Frederick's law, and that go into such details as make it very clear that university authorities had recognized the possibilities of abuses creeping in and took definite precautions to prevent them. As a matter of fact, Frederick's law, if we may judge from our own experience, is much more likely to be the expression of a gradual growth in the demand from physicians that the profession should be protected from the intrusions of the less educated. That is how we secured our own laws, and it seems not unlikely that history is repeating itself in this regard. The Bull of Pope John XXII, which was issued February 18, 1321, runs as follows:

While with deep feelings of solicitous consideration we mentally revolve how precious the gift of science is and how desirable and glorious is its possession, since through it the darkness of ignorance is put to flight and the clouds of error completely done away with so that the trained intelligence of students disposes and orders their acts and modes of life in the light of truth, we are moved by a very great desire that the study of letters in which the priceless pearl of knowledge is found should everywhere make praiseworthy progress, and should especially flourish more abundantly in such places as are considered to be more suitable and fitting for the multiplication of the seeds and salutary germs of right teaching. Whereas some time ago, Pope Clement of pious memory, our predecessor, considering the purity of faith and the excelling devotion, which the city of Perugia, belonging to our Papal states, is recognised to have maintained for a long period towards the church, wishing that these might increase from good to better in the course of time, deemed it fitting and equitable that this same city, which had been endowed by Divine Grace with the prerogatives of many special favours, should be distinguished by the granting of university powers, in order that by the goodness of God men might be raised up in the city itself pre-eminent for their learning, decreed by the Apostolic authority that a university should be situated in the city and that it should flourish there for all future time with all those faculties that may be found more fully set forth in the letter of that same predecessor aforesaid. And, whereas, we subsequently, though unworthy, having been raised to the dignity of the Apostolic primacy, are desirous to reward with a still richer gift the same city of Perugia for the proofs of its devotion by which it has proven itself worthy of the favour of the Apostolic See, by our Apostolic authority and in accordance with the council of our brother bishops, we grant to our venerable brother, the Bishop of Perugia, and to those who may be his successors in that diocese the right of conferring on persons who are worthy of it the license to teach (the Doctorate) in canon and civil law, according to that fixed method which is more fully described and regulated more at length in this our letter.

Considering, therefore, that this same city, because of its convenience and its many favoring conditions, is altogether suitable for students and wishing on that account to amplify the educational concessions hitherto made because of the public benefits which we hope will flow from them, we decree by Apostolic authority that if there are any who in the course of time shall in that same university attain the goal of knowledge in medical science and the liberal arts and should ask for license to teach in order that they may be able to train others with more freedom, that they may be examined in that university in the aforesaid medical sciences and in the arts and be decorated with the title of Master in these same faculties. We further decree that as often as any are to receive the degree of Doctor in medicine and arts, as aforesaid, they must be presented to the Bishop of Peurgia, who rules the diocese at the time, or to him whom the bishop shall have appointed for this purpose, who having selected teachers of the same faculty in which the examinations are to be made, who are at that time present in the university to the number of at least four, they shall come together without any charge to the candidate and, every difficulty being removed, should diligently endeavour that the candidate be examined in science, in eloquence, in his mode of lecturing and anything else which is required for promotion to the degree of doctor or master. With regard to those who are found worthy, their teachers should be further consulted privately, and any revelation of information obtained at such consultations as might redound to the disadvantage or injury of the consultors is strictly forbidden. If all is satisfactory the candidates should be approved and admitted and the license to teach granted. Those who are found unfit must not be admitted to the degree of doctor, all leniency or prejudice or favour being set aside.

In order that the said university may in the aforesaid studies of medicine and the arts so much more fully grow in strength, according as the professors who actually begin the work and teaching there are more skillful, we have decided that until four or five years have passed some professors, two at least, who have secured their degree in the medical sciences at the University of Paris, under the auspices of the Cathedral of Paris, and who shall have taught or acted as masters in the beforementioned University of Paris, shall be selected for the duties of

[4] Three and sixpence an ounce seems very dear, but this is the maximum.

[5] The first pure drug law.

the masterships and the professional chairs in the said department in the University of Perugia, and that they shall continue their work in this last-mentioned university until noteworthy progress in the formation of good students shall have been made.

With regard to those who are to receive the degree of doctor in medical science, it must be especially observed that all those seeking the degree shall have heard lectures in all the books of this same science which are usually required to be heard by similar students at the universities of Bologna or of Paris, and that this shall continue for seven years. Those, however, who have elsewhere received sufficient instruction in logic or philosophy having applied themselves to these studies for five years in the aforesaid universities, with the provision, however, that at least three years of the aforesaid five or seven-year term shall have been devoted to hearing lectures in medical science in some university and according to custom, shall have been examined under duly authorised teachers and shall have, besides, read such books outside the regular course as may be required may, with due observation of all the regulations which are demanded for the taking of degrees in Paris or Bologna, also be allowed to take the examination at Perugia.

We are not likely to accept this high state of medical education in the thirteenth and fourteenth centuries without further protest. We are almost sure to think that while they may have required three years of preliminary study and four years of medicine, these studies were idle and trivial or distant in significance or something very different from our methods of teaching in the modern time. This is the attitude of mind that men always assume with regard to the past. It cannot have been as good as the present. Fortunately here once more we have some good evidence. With regard to the preliminary education probably Huxley's words would carry more weight than anyone else's. In reviewing the curricula of the mediæval universities in his inaugural address as rector of the University of Aberdeen he said with regard to them:

> The scholars studied grammar, rhetoric, arithmetic and geometry, astronomy, theology and music. Thus their work, however imperfect and faulty, judged by modern lights, it may have been, brought them face to face with all the leading aspects of the many-sided mind of man. For these studies did really contain, at any rate in embryo—sometimes, it may be in caricature—what we now call Philosophy, Mathematical and Physical Science and Art. And I doubt if the curriculum of any modern university shows so clear and generous a comprehension of what is meant by culture as the old trivium and quadrivium does.

With the preliminary education disposed of so favorably to this olden time the mental protest will settle itself on the medical and surgical teaching of these old universities. We are likely to think that what they did in medicine was surely absurd or that they did nothing at all in surgery worth while talking about. It is not well to use the word "absurd" in medicine, because people in glass houses should not throw stones.

Prof. Charles Richet, of the Department of Physiology of the University of Paris, confessed not long since in an article in the French magazine, "La Revue des Deux Mondes," that the therapeutics of any period of history always seemed absurd to the second generation afterward. Over a dozen times in history this has been practically true. It is possible that we shall escape this fate, but there are some among us who are not so sure. They accepted many curious medical myths in the middle ages. The stars influenced human constitutions, climate produced disease, changes in the weather were responsible for epidemics, and they used the most curious remedies. Surely we will not blame them so much if we recall how much uric acid has meant to our generation, how much auto-intoxication seems to mean to many physicians and how curiously mistaken we were with regard to consumption when we thought it hereditary.

We, too, have used curious remedies. Every year sees the rise of a new cure for consumption; we have seen Perkins' tractors come and go, we have had Hahnemannism, we are now in the midst of Christian Science and Osteopathy. Really with the glass in our houses so thin it is rather important not to throw stones at our colleagues of the thirteenth century. They seem to have adopted the use of iron, they regulated the doses of opium, they arranged a method of or perhaps two or three methods of anæsthesia, and they regulated climatic treatment rather well. Down at Montpelier Gilbert, the Englishman, hung the room of a small-pox patient with red curtains and put them over the door and the window. He was anticipating Finsen in modern times. How far his idea was adopted we do not know. One thing is sure, that while these people did use excrementitious materials and many deterrent remedies, they also succeeded in doing much more than we think. I recently published a brief review of a book on eye diseases by Pope John XXI, the Ophthalmological Pope of the Thirteenth Century,[6] from which it is very clear that they knew much more about the treatment of the eye than we think they did.

It is probably in surgery that we would be sure that these people had done nothing worthy of our consideration at the present time. Most of us are perfectly certain that there has been such a great development of surgery during the last half century as the world never dreamt of before. As a matter of fact it is in surgery that these old-time medical educators and writers most nearly approached us, and the chapter of the "History of Surgery" is a never-ending surprise. After all on general principles it is here that one would expect to find some real progress in the olden time because surgery is much more definite and founded on scientific principles, while medicine is largely empiric and rather an art than a science even at the present time. A great century of surgery began with William of Salicet, teaching at the University of Padua. What great work William did I shall let Sir Clifford Allbutt, the Regius Professor of Medicine at the University of Cambridge, tell you, for I should almost expect that you would hesitate to accept what I have to say of him without question, since I am so much interested in this great thirteenth century. The most surprising thing is that William taught the possibility of union by first intention nearly seven centuries ago.

Prof. Clifford Allbutt, in his "Historical Relations of Medicine and Surgery" down to the sixteenth century said:

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[6] Catholic Churchmen in Science: Philadelphia: The Dolphin Press, 1909.

Both for his own great merits, as an original and independent observer, and as the master of Lanfranc, William Salicet (Guglielmo Salicetti of Piacenza, in Latin G. Placentinus de Salicetonow Cadeo), was eminent among the great Italian physicians of the latter half of the thirteenth century. Now these great Italians were as distinguished in surgery as in medicine, and William was one of the Protestants of the period against the division of surgery from inner medicine; a division which he regarded as a separation of medicine from intimate touch with nature. Like Lanfranc and the other great surgeons of the Italian tradition, and unlike Franco and Ambroise Paré, he had the advantage of the liberal university education of Italy; but like Paré and Wurtz, he had large practical experience in hospitals and on the battlefield. He practiced first at Bologna, afterward in Verona. William fully recognized that surgery cannot be learned from books only. His surgery contains many case histories, for he rightly opined that good notes of cases are the soundest foundation of good practice; and in this opinion and method Lanfranc followed him. William discovered that dropsy may be due to a *durities renum;* he substituted the knife for the Arabist abuse of the cautery; he investigated the causes of the failure of healing by first intention; he described the danger of wounds of the neck; he sutured divided nerves; he forwarded the diagnosis of suppurative disease of the hip, and he referred chancre and phagedaena to *coitus cum meretrice.*

Of William's great disciple Lanfranchi, or as his name has been gallicized Lanfranc because he did his teaching at Paris, Sir Clifford has almost as much to say. Perhaps the most interesting feature of Lanfranc's life for us who are tracing the story of medical education is the fact that the faculty of the University of Paris recognizing that a great new school of surgery had arisen in Italy, and, wishing that the university should have the advantage of it, sent a thousand miles down to Italy and invited Lanfranc, whose reputation had reached them, to come and be the Professor of Surgery at the University of Paris. That story itself is the contradiction of nearly every thought that we foster with regard to the Middle Ages. We are apt to think of them as narrow, impractical, uninterested in others, occupied with themselves, not knowing what others were accomplishing, but here is a single fact that "makes ducks and drakes" of all our *a priori* reasoning. Perhaps the most interesting feature remains. Lanfranc went to Paris, established a great school of surgery, and the tradition that he left behind him made the French the greatest surgeons of Europe until the middle of the nineteenth century. If anything in the world would make us realize how important a leader of thought may be, this should.

Sir Clifford Allbutt said of this great Professor of Surgery:

> Lanfranc's "Chirurgia Magna" was a great work, written by a reverent but independent follower of Salicet. He distinguished between venous and arterial hemorrhage, and used styptics (rabbit's fur, aloes, and the white of egg was a popular styptic in elder surgery), digital compression for an hour, or in severe cases ligature. His chapter on injuries of the head is one of the classics of mediæval surgery. Clerk (cleric) as he was, Lanfranc nevertheless saw but the more clearly the danger of separating surgery from medicine.

After Lanfranc came Mondeville. He was almost as great as either of the two supreme teachers who preceded him. Pagel, of Berlin, one of our greatest living authorities in the history of medicine, recently wrote an article on one phase of Mondeville's career for the Festschrift in honor of Professor Binns. This tells the story of how Mondeville employed venesection. It has a particularly interesting paragraph with regard to the necessity of properly impressing the patient's mind before a venesection was undertaken, because otherwise one did not get as good results, and, sometimes, as a consequence of dispiritment, the blood did not flow as freely as it should. Mondeville's discussion of the indications for venesection shows, according to Pagel, how careful a man he was and how thoroughly he recognized the usefulness and the limitations of this mode of treatment.

After Mondeville comes the greatest of them all—Guy De Chauliac, the Father of Modern Surgery. Because he was a Papal physician I have sketched his life at considerable length in my book on "The Popes and Science,"[7] though all that I have to say of him practically comes from Pagel, Clifford Allbutt, Nicaise Portal, Malgaigne, and Chauliac's own great book, the "Chirurgia Magna," written, as he tells us himself, as a *solatium senectutis.*

Chauliac's right to the title of Father of Surgery will perhaps be best appreciated from the brief account of his recommendations as to the value of surgical intervention, for conditions in the three most important cavities of the body, the skull, the thorax, and the abdomen. These cavities have usually been the dread of surgeons. Chauliac not only used the trephine, but laid down very exact indications for its application. Expectant treatment was to be the rule in wounds of the head, yet when necessary, interference was counselled as of great value. His prognosis of brain injuries was much better than that of his predecessors. He says that he has seen injuries to the brain, followed by some loss of brain substance, yet with recovery of the patient. In one case that he notes, a considerable amount of brain substance was lost, yet the patient recovered with a slight defect of memory only, and even this disappeared after a time. He lays down exact indications for the opening of the thorax, that *noli me tangere* of surgeons of all times, even our own, and points out the relations of the ribs and the diaphragm so as to show just where the opening should be made in order to remove fluid of any kind.

In abdominal conditions, however, Chauliac's anticipation of modern views is most surprising. He recognized that wounds of the intestines were surely fatal unless leakage could be prevented. Accordingly he suggested the opening of the abdomen and the sewing up of such intestinal wounds as could be located. He describes a method of suture for these cases and even invented a needle holder. To most people it would seem absolutely out of the question that such surgical procedures could be practiced in the fourteenth century. We have the definite record of them, however, in a text-book that was the most read volume on the subject for several centuries. Some of the surprise with regard to these operations will vanish when it is realized that during the thirteenth century in Italy a method of anæsthesia by means of opium and man-

[7] Fordham University Press, N. Y., 1908.

dragora was in common use, having been invented by Ugo da Lucca and Chauliac must not only have known of it, but must have employed it frequently. We have nothing from him directly bearing on this subject, but then even in our own time surgeons do not discuss anæsthesia, but assume a knowledge of it.

Hernia was Chauliac's specialty, and in it his surgical judgment is admirable. He did not hesitate to say that many operations for hernia in his time were done, not for the benefit of the patient, but for the benefit of the surgeon's pocket—a remark that will strike a sympathetic cord in many medical minds even at the present time. I have a copy of an old-time cut that shows a surgeon of the thirteenth century operating for hernia with the patient inverted on a slanting plank—an exaggerated Trendelenburg position—that shows how the mechanical side of surgery was developed at this time. Chauliac's rule was that a truss should be worn, and no operation attempted unless the patient's life was endangered by the hernia. It is to him that we owe the invention of the method of taxis, or manipulation of a hernia, to bring about its reduction, which was in use until the end of the nineteenth century. He emphasized very strongly that trusses could not be made according to general rules, but must be adapted to each individual case. He invented several forms of truss himself, and in general it may be said that his manipulative skill and his power to apply mechanical principles to his work are the most characteristic of his qualities. This is particularly noteworthy in his chapters on fractures and dislocations, in which he suggests various methods of reduction and realizes very practically the mechanical difficulties that were to be encountered in the correction of the deformities due to these pathological conditions. In a word, we have a picture of the skilled surgeon of the modern time in this treatise of the fourteenth century surgeon.

Chauliac's book is confessedly a compilation. He has taken the good wherever he found it, though he adds modestly enough, that "his work also contains whatever his own measure of intelligence enabled him to find useful (*quæ juxta modicitatem mei ingenii utilia reputavi*)." Indeed it is the critical judgment displayed by Chauliac in selecting from his predecessors that best illustrates at once the practical character of his intellect and his discerning spirit. What the men of his time are said to have lacked is the critical faculty. They were encyclopædic in intellect and gathered all kinds of information without discrimination, is what is usually said of mediæval writers. No one can say this of Chauliac, however, and above all he was no respecter of authority merely for the sake of authority. His criticism of John of Gaddesden's book shows that the blind following of those who had gone before was his special *bête noire*. His bitterest reproach for many of his predecessors was that "they followed one another like cranes, whether for love or fear, he would not say."

It must not be thought, however, that it was only with the coarser applications of surgery that Chauliac concerned himself. He was very much interested in the surgical treatment of eye diseases, and wrote a monograph on cataract, in which he gathers what was known before his time and discusses it in the light of his own experience. The writing of such a book is not so surprising at this time, if we recall, as I have suggested, that in the preceding century the famous Pope John XXI, who had been a physician before he became Pope, and under the name of Peter of Spain, was looked up to as one of the distinguished scientists of his time, had written a book on eye diseases that has recently been the subject of much attention. Pope John had much to say of cataract. Chauliac's method of treating cataract was by depression. His care in the selection of patients may be appreciated from his treatment of John of Luxemburg, King of Bavaria, blind from cataract, who consulted Chauliac in 1336, while on a visit to Avignon with the King of France. Chauliac refused to operate, however, and put off the king with dietary regulations.

The more one reads of Chauliac's work, the less is one surprised at the estimation in which he has been held wherever known. Modern writers on the history of medicine have all been enthusiastic in their admiration of him, just in proportion to the thoroughness of their acquaintance with him. Portal, in his "History of Anatomy and Surgery," says: "Finally it may be averred that Guy de Chauliac said nearly everything which modern surgeons say and that his work is of infinite price, but, unfortunately, too little read, too little pondered." Malgaigne declares, Chauliac's "Chirurgia Magna," "a masterpiece of learned and luminous writing." Prof. Clifford Allbutt says of Chauliac's treatise: "This great work I have studied carefully and not without prejudice; yet I cannot wonder that Fallopius compared the author with Hippocrates, or that John Freind calls him the Prince of Surgeons. It is rich, aphoristic, orderly and precise."

Julius Pagel, in Puschmann's "Handbook of the History of Medicine," says:

> Chauliac represents the summit of attainment in mediæval surgery and laid the foundation of that primacy in surgery which the French maintained down to the nineteenth century.

The medical profession had then an excellent status at this time. The requirements in education in the medical schools of the universities of the thirteenth century were reflected in the laws of the time, making it impossible for any but the thoroughly educated physician to practice medicine at least in the more populous districts. This state of affairs was evidently brought about by an educated public opinion which had come to look upon the medical school as a university department to be entered only after under-graduate training had been completed. As a consequence of this state of mind we have seen the magnificent examples of the products of these real university medical schools. They were men who did original work of the highest kind in medicine and above all in surgery. Medicine as a science was not developed for many centuries yet, but these university-trained physicians who represented, just as have both the Regius Professors of Physic in England in the twentieth century—Osler at Oxford and Allbutt at Cambridge—the separation of medicine from surgery,

did magnificent original work in developing the art of surgery. There is very little that we have accomplished in the modern time that they did not anticipate. The group of men from William of Salicet through Lanfranc and Arnold of Villanova, including Yperman of Belgium, Ardern of England, down to Guy de Chauliac, the great Father of Modern Surgery, were as great contributors to medicine as have ever lived.

One would be tempted to say, and say it seriously, that Paris at the end of the thirteenth and the beginning of the fourteenth century was doing at least as good work in its medical department as the Medical School of Johns Hopkins is accomplishing at the present time. Certainly the group of men associated with Paris did wonderful original work and wrote marvellous books that were to be far-reaching in their influence. The astonishing thing about it all is that there should have been in subsequent centuries such a great descent from the standards thus set up. How did it happen that nearly six centuries after this time here in America we required only two terms of 16 weeks each before we gave the degree of Doctor of Medicine, and required so little preliminary training that if a man could read and write, and not very well at that, he was permitted to take up the medical course. Of course in the pioneer days in America we needed physicians so badly for our rapidly growing population that there was some excuse. Later on this awful condition was fastened on us by the unwillingness of teachers to give up the large pecuniary benefits and reputation derived from the medical school system arranged, as it was, quite apart from any organic connection with the university.

Of course this question is a portion of that larger question how do men forget what they have once accomplished? The Suez Canal is said to have been opened once before our time, and America to have been discovered twice before Columbus; Troy, after having been destroyed and built several times, was utterly lost to human memory until Schliemann found it again for us; the very palaces of the Roman emperors in Rome itself became covered with an accumulation of soil and dust and were entirely forgotten, though Rome was never without inhabitants. The more one goes back to the story of the past the more does one realize that human history is a series of discoveries followed by forgettings and then re-discoveries, though man is supposed to be so much interested in his own progress and to be in such a state of evolution that this should apparently be impossible.

One is tempted to think of Goethe's lines in which, though it is Mephistopheles who uses the expression in order to discourage man, there is surely to be seen in it some reflection of Goethe's own thought with regard to man and his ways. Mephistopheles says:

> Original! move onward in your pride,
> Oh! how the spirit would sink mortified,
> Could you but know that long ago,
> All thoughts whatever, dull or clever,
> That cross the twilight of your brain,
> Have been o'er and o'er again,
> Occupying other men.[8]
> Age is, in sooth, a fever cold,
> With frosts of whims and peevish need:
> When more than thirty years are told,
> As good as dead one is indeed:
> You it were best, methinks, betimes to slay.

[8] Perhaps in the light of a misapprehension of former times at Johns Hopkins it may not be out of place to quote the lines of the recent graduate Baccalaureus to which Mephistopheles' expression is almost the direct answer.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

March 15, 1909.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Frank R. Smith, the president, in the chair.

I. **Relative Aortic Incompetency of Muscular Origin.** Dr. J. M. Anders, Philadelphia.

See p. 205 of this number.

Discussion.

Dr. Futcher.—We owe a debt of gratitude to Dr. Anders for pointing out this probable etiology of certain cases of aortic insufficiency. Relative aortic insufficiency is now kept in mind, but usually considered due to dilatation of the ring from some cause above, as aneurysm of the aortic arch.

It is possible that a considerable percentage of the murmurs are not constant. This is observed on ward visits. And these are probably due to weakened tone of the heart muscle.

Cabot has pointed out that a certain number of cases of pernicious anemia have a diastolic murmur which is not constant and disappears with improvement in the blood picture.

Dr. Anders, in reply.—The murmur alone does not distinguish pulmonic from aortic insufficiency. But the secondary manifestations of capillary pulse and collapsing pulse are definitely distinct. The pulse is less collapsing than in the true organic insufficiency, and the hypertrophy is less.

Hypotonicity of all the muscle in pernicious anemia is the cause of relative insufficiency. The explanation of the aortic ring muscle and its importance is satisfactory.

Aortic insufficiency of this type is important to keep in mind for prognostic and therapeutic purposes, particularly those following the acute infectious fevers.

April 5, 1909.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Norton presiding in the absence of Dr. Smith, the president.

I. Vegetative Aortitis with Aneurysm of the Ascending Portion of the Aorta. Dr. G. E. Holtzapple, York, Pa.

After a careful description of syphilitic aortitis, the author then read the following history of a case:

L. T., male, age 42, photographer, came to my office May 18, 1908, and complained of feeling badly, having pain in the head, and a severe aching in all of his extremities.

His appetite was poor and he felt sore over the whole of the abdomen.

There was no vomiting, no diarrhœa.

His throat was congested but not painful.

Family History.—His father died from epithelioma of the face, aged about 65; his mother died from lobar pneumonia at about the same age. Most of his sisters and brothers are nervous, otherwise I am unable to learn of any important family history.

The patient had inflammatory rheumatism at 15. He had follicular tonsilitis several times since. He had considerable trouble with more or less soreness of his throat which would require local treatment. At no time did he have any ulcers. He was sometimes troubled with lumbago, also with hives.

He had pleurisy with effusion in 1900. At times he suffered from hyperacidity since this illness requiring antacids and nerve sedatives. These attacks always occurred when he was very nervous due to overwork and worry and had not enough sleep. He had attacks of sick headache before he was 22, not afterward. He denied having had any form of venereal disease.

On his first visit to my office I made no careful examination. I prescribed an antiseptic gargle, and internally salol, acetophenetidin and caffein. He continued doing some work. Four days later he returned not much improved. I advised him to rest which he did. In a few days he was improved and he resumed work in the gallery until June 3, when he was again in the same condition as before.

He now took to his bed. He complained of pain in the head and back, also in the extremities. He looked sick, color of lips, mucous membranes and skin was pale. There was no cyanosis, no jaundice, no œdema, no dyspnœa, but slight cough. There was no eruption or discoloration of the skin. There was no delirium, nor marked nervous symptoms. He had moderate fever, and the pulse was accelerated. The face was pale, at no time flushed. The tongue was moist, slightly coated with a white fur, edges and tip were not particularly clean. There was no epistaxis.

The chest was well formed, expansion good, about the same on both sides. The percussion note was slightly impaired above the clavicles. Few moist râles were heard on deep breathing and coughing.

The præcordia was very slightly prominent. At this time he did not complain of any pain or discomfort over the cardiac area. Cardiac impulse was a little diffuse. The apex impulse was a little outside of the left nipple line and a little lower than normal. It was rather strong. There was a systolic thrill felt over the aortic area. Area of deep cardiac dullness was increased to the left. Heart sounds were all heard and of about normal intensity.

There was a systolic murmur heard over the whole præcordia and even outside, having its maximum intensity over the aortic area. It was loud and rough and transmitted into both carotids, but heard more distinctly over the right than over the left. It was heard with less intensity over the apex and not transmitted much to the left. There was also heard an aortic diastolic murmur over the aortic area, along the left border of the sternum, and with diminished intensity at the apex.

The pulmonic second sound was not accentuated. The pulse seemed regular in force and rhythm to the palpating fingers, about 100 per minute. It was distinctly collapsing, especially when the arm was elevated. A capillary pulse could be made out. A pistol shot sound was well marked over the femorals, but no Durozicz's murmur. These physical signs I had often noted since March, 1900, and without any marked change, except a slight increase in the roughness and intensity of the systolic murmur and thrill. There was no diastolic shock over the base.

The abdomen was full but not distended. There were no rose spots, or dilated veins visible. On deep inspiration one could see the descending shadow of the spleen but not of the liver. The spleen was very easily felt and tender. It was considerably enlarged. There was tenderness along the right costal border, but the edge of the liver was not distinctly felt. The vertical line of liver dullness was somewhat increased. The whole abdomen was slightly tender, most marked in the right iliac fossa. There was typical gurgling in this area. The patient often complained of burning in the stomach. There was no vomiting and no diarrhœa. Enemata were often required to move the bowels.

There were no lymphatic glands palpable, including the epitrochlears. There were no visible scars.

There were no special motor or sensory symptoms present. The deep reflexes were slightly exaggerated. There was no ankle klonus, no Babinski's sign, no paræsthesia.

Special senses were not involved, there were no mental symptoms. Urinalysis was negative, except it gave a distinct diazo reaction.

This condition continued with very little change, the evening temperature ranging from 100 to 102 F., for five weeks when the temperature remained normal. The treatment had been symptomatic, rest and liquid diet. His diet was gradually increased but after two weeks he rapidly relapsed into the same condition he was in before.

He was again put on a liberal liquid diet, rest was enjoined and treatment was symptomatic. Water was given very freely. After five weeks the temperature again reached the normal. There was no trained nurse in charge and the temperature was only taken at my visits usually toward evening.

The clinical features during the second febrile course were just the same as during the first.

The patient was again put on soft food and gradually on a regular diet, but at the end of two weeks he again had fever toward evening and at the same time severe pain in the lower extremities, especially below the knees. In the morning his temperature was usually lower and he was free from pain. I was unable to account for the pain in his lower extremities, and this he only had when his temperature was considerably elevated, reaching in the evening 103 to 104 F.

There was no localized swelling or tenderness along the bones. The muscles were sore. The temperature, touch, pain and deep muscle sense did not seem to be impaired. Motor power was diminished due to emaciation. Deep reflexes continued slightly exaggerated. The spleen continued enlarged, but was gradually diminishing in size until it was only palpable by placing patient on right side with thighs flexed. The area of splenic dullness was distinctly increased at all times.

At this period there was at times some tenderness over the region of the gall-bladder.

During the middle of September he had a number of severe chills about 11 a. m. followed by fever and sweat. On examining the blood, I found no plasmodia. Leucocytes were now 8000. I administered sufficient quinine to give him the therapeutic test, but without any improvement. The temperature now became irregular, and he had profuse sweats.

He now suffered from severe pains in his legs and shoulders, in the chest, over the præcordia and in the region of the spleen. He was taken with very sudden pain in the left chest, but spleen did not increase in size, and there was no friction rub audible and no bloody sputum nor dyspnœa.

The patient now began to look very sick. The diagnosis was

not clear to me. At first I thought it might be an atypical typhoid, then later tuberculosis, malaria, trichiniasis, endocarditis, but the leucocytes had only been 8000.

On September 27, Dr. Futcher saw the case with me and he felt morally certain it was a case of malignant endocarditis. A few days after this the patient began to have cutaneous infarcts and these later on became innumerable over the thighs, hips and lumbar regions. He now had an infarction of the spleen. The onset of pain was sudden, the organ increased rapidly in size and was very tender. A to and fro friction rub became audible over the sternum at a level of the second and third costal cartilages, nowhere else audible over the cardiac area. He had dull diffuse pain in this region. There were no physical signs of an effusion in the pericardium. At the suggestion of Dr. Futcher he was given potassium iodide, which was increased to gr: XXV t. i. d. when it disagreed much with his stomach and had to be discontinued. Emaciation was slow and anæmia increased gradually. During the latter part of October œdema began to develop in the ankles, which gradually extended up his lower extremities.

His abdomen now became distended and moist râles became numerous throughout the chest. The œdema now became very marked involving scrotum and penis.

The pulse became gradually more frequent and weaker but was regular. He had more cough. He now had attacks of dyspnœa, of sudden onset, attended by very marked anxiety. Stimulants gave but partial relief. He felt a sense of oppression in the region of the heart. These attacks recurred at irregular intervals and until the night of November 7, when he died suddenly in such an attack.

At the autopsy I found diffuse bronchitis, hypostatic congestion, at the base of both lungs, and both apices studded with tubercles.

There was a large infarct in the spleen, which organ was much enlarged. The liver was considerably larger than normal. No infarction of liver, kidneys or intestines.

There was a small quantity of fluid in pericardium. On the anterior surface of the ascending portion of the arch was an aneurysm which had about half a dozen sacs within, all filled with vegetations which crumbled out very easily on handling it.

There was an aortic stenosis and insufficiency due to previous disease, and degenerative change following an endocarditis.

In the right heart I found two large pale, firm clots of fibrin extending from the right auricular appendix to the tricuspid orifice which I believe caused his sudden death.

Discussion.

Dr. Futcher.—I saw this patient when he presented the typical picture of aortic insufficiency. The chills, fever, and sweats suggested a vegetative endocarditis with septicæmia, a fresh endocarditis upon old sclerotic aortic valves. This autopsy has shown a vegetative endocarditis in the aneurysmal sacs which themselves have bulged into the pericardial sac. The aneurysm was not suspected. It was impossible to make it out. It is quite probable this is a luetic endarteritis. These may be mycotic aneurysms with a vegetative endocarditis.

Dr. Barker.—We are grateful to Dr. Holtzapple for showing us so interesting and rare a specimen. It shows how much can be done by a general practitioner in following cases and obtaining autopsies.

The case suggests to me not syphilitic aortitis, but mycotic aneurysms. It is a wonderful instance of it! They are usually multiple, about the body in the smaller vessels, due to infected emboli and the resultant softening of the vessel walls. In a few cases they arise as a true infection of the arterial wall.

Dr. Osler, in 1885, described three, the size of cherries, and a fourth, the size of a billiard ball, in the wall of an aorta. Holtz reported two in the aorta due to the gonococcus.

This man was 42, had no history of lues but one of tonsilitis, rheumatism, and old endocarditis. These all point to mycotic aneurysms. The pains in the extremities may have been due to aneurysms there.

Dr. MacCallum.—Dr. Holtzapple's review of the literature was admirable! I was present when Chiari and others thrashed out the subject of luetic aortitis six years ago. The solution is in studying for spirochætæ. This specimen is probably one of mycotic aneurysms.

II. Tumors of the Male Breast, with a Report of an Unusual Case.

Gerald Griffin, M. D., Albany, N. Y.

Tumors of the male breast are by no means infrequent, but they are rare enough to justify a review of the literature on the subject and to report an interesting case that has recently been under my observation. The case was a bilateral adenofibroma of both breasts in a male adult occurring at different intervals within a short time.

The male and female breasts have about the same anatomical nature at birth and up to the time of puberty. At puberty the female breast undergoes a series of functional changes. Slight enlargement with some pain is sometimes noticed in the male breast, but the gland usually remains rudimentary, and except in rare instances never functions.

Many theories have been advanced to explain the rarity of new growths in the breast of men as compared with women. Warfield in his excellent paper on carcinoma of the male breast offers the most satisfactory one. He recognizes the fact that the gland in the first place is apt to be injured during the period of lactation, and secondly that it passes through a series of changes which have a tendency to make it susceptible to new growths of various kinds. Up to the time of puberty the gland is similar in both sexes. After puberty the gland in the male becomes quiescent, and in the female, undergoes a growth of the acini and ducts, with an increase in the blood supply. After each pregnancy proliferation takes place in the gland with an increase in fibrous tissue. With the danger of accidents occurring during the activity of the glands, it is not surprising to find the larger per cent of new growths occurring in the female breast. The same etiological factor, however, is present in the causation of carcinoma. If we are to look upon carcinoma as being of an infectious nature, and if the bacillus is demonstrated in all cases, our present theories as to the comparative rarity of the disease in the male breast will of necessity be exploded.

Schuchardt in 1884 gave the following interesting résumé of the literature up to that time: "Milton in 1857 reported 40 cases of carcinoma; Wagstaffe in 1876, 21 cases. Paulin Poirer reported 62 cases, including carcinoma, sarcoma, tubercle, etc. Schuchardt describes 172 neoplasms. Of the 172 cases there were 2 adenomata; 1 enchondroma; 3 fibromata; 1 myoma; 1 cutaneous deposit, 15 cystic; 2 tuberculous. The

remainder were carcinomatous. Syphiloma may also occur. Of the 89 patients having cancer of the breast none were under 20 years.

3	were	between	20-29
8	"	"	30-39
26	"	"	40-49
27	"	"	50-59
16	"	"	60-69
9	"	"	70-79

One occurred at the age of 84. In 42 of the 53 cases the axillary glands were involved.

Williams, in his studies of the statistics previous to 1889 of the University College, Middlesex, and St. Thomas' and St. Bartholomew's Hospitals of London, relating to new growths occurring in the male breast, gave one-half of one per cent as the average as compared with the other organs of the body, while compared with the female the average was about one in one hundred. In Warfield's series of cases the age at which the growth appeared varied from 40 to 70. The youngest was 12 years and the oldest 91 years. Out of 300 operations for tumors of the breast Elting had only one occurring in the male breast, that of an adeno-fibroma in a male patient aged 45.

Sarcomatous growths are occasionally met with in the male breast and usually of the spindle cell variety. Shields in his book describes a number of cases and calls attention to the liability of a sarcoma developing from a mole on the breast when irritated. Connell, in an elaborate review of the literature on sarcoma, found 4 cases occurring between the ages of 20 and 25; 3 between the ages of 30 and 35; 2 between the ages of 35 and 40; 1 between the age of 45 and 50; 5 between the ages of 50 and 55; 1 between the age of 55 and 60, and 1 at the age of 73. Axillary involvment was present in 9 cases, the tumor was found adherent in 5 cases, to the pectoral muscle and fascia in 3 cases. The location in 11 instances was given in the right breast, and in 6 instances in the left. The growth was recurrent in 3 instances and in the others the duration varied from 1 week up to 7 years. In only one instance was trauma mentioned. There were in the collection 12 spindle-celled sarcomas; 7 round-celled; 3 cystic; 3 melanotic; and 3 chloroma; there were 15 recoveries and 4 deaths.

Of the benign tumors of the male breast, cysts and adeno-fibromata are the most common. Fibromata, enchondromata, lipomata, papillomata may be met with, but not so frequently as the first named. In Schuchardt's series of 172 neoplasms occurring in the male breast, only 25 were of benign origin, including 2 which were tuberculous.

Cysts may be, and often are, of a malignant nature, and may be found in the skin, in the region of the pectoral muscles, in the ducts or in the connective tissue spaces. Cysts of the breast may suppurate and form a mammary abscess or they may appear just beneath the nipple, causing a bluish discoloration, which may lead you to suspect the presence of carcinoma.

C. F. Beadles in 1892 reported a case of pure fibroma of the male breast with the following comment: "The case is of interest, not only on account of the comparative rarity of a tumor in the male breast, but also the extreme rarity of a simple fibroid tumor of the mammary gland."

The case I am to report is of interest, not only on account of its comparative rarity, but also from the fact that the growth appeared in both breasts within a period of four weeks.

HISTORY OF THE CASE.

Mr. P. McG., age 45, single, nativity Ireland, by occupation an hotel proprietor, consulted me first on October 1, 1908. He complained of a lump in his left breast.

Family History.—Father died from unknown causes; mother died of typhoid fever. No history of cancer, tumor or tuberculosis in any member of his family.

Personal History.—He had the usual diseases of childhood. Had an attack of rheumatism three years ago. Denies ever having had any venereal disease. Smokes and drinks moderately.

Present Illness.—About seven weeks ago patient struck his left breast against the edge of his bed. Since that time he has noticed his breast slowly enlarging. There has been no pain, but he worries considerably about it, fearing cancer may develop.

Physical Examination.—Patient is a well nourished individual, weighing 190 pounds; his height is 5 feet 11 inches. Skin and mucous membranes normal. Abdomen rather prominent and apparently well supplied with adipose tissue. Varicose veins present in both legs. Thorax well developed, with no evidence of cardiac or pulmonary disorder. The left breast is symetrically enlarged and occupied by a tumor the size of a small hen's egg. It is firm and not painful, freely movable, and occupies an area surrounding the nipple about 3 cm. in circumference. The right breast presents no evidence of enlargement and is apparently normal. There is no axillary involvement on either side.

The diagnosis of adeno-fibroma was made and early removal of the tumor advised. The patient entered the hospital on October 5, 1908, and on the following day, under ether anæsthesia, the growth was removed. It involved only the breast tissue, although rather adherent to the pectoral muscle. The wound healed by primary union and the patient left the hospital in a few days. The macroscopic appearance of the tumor was that of an adeno-fibroma and the microscopical report by S. B. Walback of the Bender Laboratory, Albany, N. Y., confirmed the diagnosis. On November 10, 1908, four weeks after leaving the hospital, the patient again consulted me, complaining of a growth in his right breast. He first noticed it about a week after leaving the hospital and it grew so rapidly he thought it best to have it removed. On examination, the tumor was found similar in every way to the previous one in his left breast occupying a space just beneath the nipple. On the next day under local anæsthesia, the breast was removed and was found to contain an adeno-fibroma about the size of an English walnut. The laboratory report confirmed this diagnosis also. The patient has entirely recovered and up to the present time has had no further trouble.

Much has been written about the origin of adeno-fibromata, and a good deal of doubt has been expressed as to the possibility of having a pure fibroma without the presence of some epithelial cells. Paul Theile says that the fibro-adenoma, the cysto-sarcoma phyllodes, and the mastitis chronica cystica, together form a group of diseases of the breast gland, which originate from the same elementary histologic changes, and which are distinguished only by the more or less marked circumscription, and the predominating proliferation of the connective tissue in some, and of the epithelium in other cases. He also writes that it is impossible to demonstrate clinically when malignant degeneration begins and it is therefore im-

portant to remove all circumscribed forms of tumors. The histologic examination should be carefully made, as early carcinoma may be confined to a single area.

Schimmelbush, in an interesting comment on adeno-fibromata, writes: "They were first described by Cruveilhier as growths furnished with a connective tissue capsule, freely movable, never forming connection with the muscles or pectoral fascia, and only forming adhesions with the skin when some special irritation exists. The size of these tumors varies very much, some being as large as a child's or man's head. There is no relation, however, between the size and age of the tumor. Fibro-adenoma is more frequent in early life, but is seen sometimes in patients over 50 or 60. Cruveilhier named them 'fibroma' at first, subsequently admitting their glandular character. Pure fibroma of the breast is extremely rare. During the last three years all the mammary tumors in Bergman's clinic have been examined, and not a single fibroma has been found."

Bloodgood reported six cases of diffuse hypertrophy occurring in the male breast, only one breast being involved. The gross and microscopical appearances of the six cases resemble adeno-fibroma. He gives the time of onset from three weeks to two years and advises early removal, as he believes sarcoma and carcinoma may develop, especially sarcoma. Since reporting the above six cases, Bloodgood has observed two cases of bilateral diffuse hypertrophy of the male breast.

Patterson in 1892 reported three cases of adeno-fibromata; two occurring in the breasts of girls before puberty, and one in the breast of a male, aged 24, the first tumor of the kind he had observed.

Monro in 1892 reported a case of adeno-fibroma of the male breast, following a kick received from a horse 18 months previously.

Jacobson of Syracuse reported an interesting group of cases in 1897 of tumors affecting the male breast. His first case was one of a large epithelioma with axillary involvement in a man aged 70. The second case was a sarcoma in a patient aged 77, with axillary involvement. Both succumbed from metastases within three years of the time of operation. The third case was one of fibro-adenoma in a man aged 52, appearing about six months following an accident in which he fell striking his breast. The tumor grew very rapidly, and while there was no involvement, it was thought best to empty the axilla. Jacobson looked upon fibro-adenoma as being the rarest condition encountered in a large number of cases he quoted, it having appeared but once in the male breast as against 400 times in the female.

From the above review of the literature on the subject of tumors of the male breast, it is readily seen that such growths while not common occur frequently enough to make an early diagnosis important. It is often impossible clinically to determine when malignancy begins, and all tumors should be therefore looked upon with suspicion and their early removal advised.

I have been unable to find recorded a case parallel to the one I have added to the literature to-night and trust that it may prove a stimulus to surgeons to report any similar condition coming under their observation.

Discussion.

Dr. Barker.—There was a case on Ward F this winter of an old man with carcinoma in aberrant breast tissue in the left axilla. On removal it proved to be adeno-carcinoma. Situated in the left anterior axillary line, it must have been of aberrant mammary gland tissue.

III. Use of Scarlet Red in Epitheliation of Granulating Wounds.

Dr. J. S. Davis.

See the preceding number of the Bulletin.

Discussion.

Dr. Barker.—Has the effect of scarlet red been studied upon embryos? It is a remarkable therapeutic effect and gives great hope of the success of drugs!

Dr. Cone.—I have used this stain in Albrecht's laboratory and found a relation between it and the fat throughout the layers of the skin. Only in the stratum granulosum is the fat in close relation to the nucleus. Here is where active nuclear division takes place. Here is where regeneration occurs. And there is probably some affinity between the fat and the stain which it takes. Dr. Welch considers this very likely.

NOTES ON NEW BOOKS.

Concerning Lafcadio Hearn. By George M. Gould, M. D. With a Bibliography by Laura Stedman. (*Philadelphia: George W. Jacoby & Co., Publishers.*)

Biographies, as a rule, are mere narratives of events and have no scientific interest except that they furnish data for study by specialists. Dr. Geo. M. Gould has long been using such material for his biographic clinics, in which he presents the symptoms of the diseases suffered by certain eminent men, but he has now written a biography of a new kind, in which the symptoms are the foundation and not mere chronological incidents, though in this case it is not so much a study in pathology as in abnormal psychology. To be sure, every biographic study is that of the abnormal, for if a man has accomplished anything of sufficient importance to warrant the publication of a biography, he must be markedly different from the hundreds of millions who pass through life with the crowd, without a single achievement showing the possession of an unusual talent. Lombroso and other students of genius have been able to show a profusion of abnormalities in each great man of the world, for it is an almost invariable rule, that if the developing ovum is so unstable as to be diverted from the path in which heredity guides, it will depart as a whole, and abnormalities will be found in every part and tissue—and by heredity is meant the reaction of the protoplasm to its environing forces. Unlikeness to parent is the rule, simply because the environment can never be an exact repetition of that in which the parents or more remote ancestors developed.

The medical profession must wake up to the tremendous power of the environment to modify organisms, and realize that great

abnormality means that great forces have operated to prevent inheritance. In Hearn's case, unfortunately, there is so little known of his ancestry that we cannot tell what he would have been had not these forces existed, nor is there the slightest clew as to what were the causes of the abnormalities. We can only study the result—the poor, undersized, myopic artist, shy to a degree and with a standard of ethics all his own—a characteristic, by-the-way, of every genius. He was not a creator in any sense of the word, but a translator of the creations of others, a transformer, mirror or echo. But he was a peculiarly warped reflector, which clothed the reflex in masterful English with such added beauties that his writings seem destined in time to take a place with those of Poe, who was essentially a creator. Curiously enough the grewsome occupied much of the attention of these two minds. In this mirroring of environment, Hearn was not different from any other artist, be he actor, painter or singer.

It has become a canon of ethics to say nothing ill of the dead, and to magnify their good. Writers generally follow this rule, so that biographies are notoriously incomplete and inaccurate, if not actually untruthful. Gould has been bitterly criticized by some of Hearn's friends, who resented the seeming violation of ethics in describing the mental peculiarities of the dead artist, but they should be thankful that he has shown that Hearn's well-known acts were not the result of deliberate viciousness, but merely what we must expect from the abnormal, who are also invariably defective in some way. Hearn worked with the brain tools he had and his materials were only those perceptions his defective physique brought to his tools. All, except the psychologist, forget that the brain is such a complex organ with so many billions of cells, that by the ordinary law of chance it is practically impossible for two minds to be alike, even among those we are pleased to call normal men. Among the abnormal, vast differences are inevitably found, and while no one dreams of blaming a brainless idiot for his inability to produce any thoughts, it does seem strange that we think that a man born with an extraordinarily constructed brain is to be blamed or praised for the work of that organ. Men must think with the tools they were born with and deserve no more credit than Caruso does for the possession of a wonderful larynx. An explanation of why a man has lived his particular life is far different from a mere enumeration of its evil sides. No doubt the critics have in mind the frightful injustice done to Poe by his early biographer, who gave him a bad reputation with the very flimsiest of justification, but in Hearn's case there is a scientific attempt to explain what has been so painfully apparent in all accounts of this curious word-colorist. It is not so much a dissection by a friend as an apology.

Man is made up not only of what heredity gives him, but also the modifications due to the forces of the environment, be they prenatal poisonings and malnutrition or post-natal factors good and bad. Gould has added another thought that "character" is a compound of the environment working on this organism. We have no control over our perceptions and must get along with those brought to us by a notoriously imperfect physique. They may be so distorted, hazy or colored as to give us, as they did to Hearn, a very incorrect idea of the world in which we find ourselves. This is a materialistic view no doubt, but it is the inevitable result of modern psychology, and will go far in explaining the apparent inconsistencies of great men, their absurd mistakes in matters outside of their proper sphere and the extreme inaccuracy of their perceptions and resulting conceptions in affairs for which they are built. A myopia may be the result of some adverse environing factors modifying the developing eye, and in turn it becomes part of the environment profoundly modifying "character."

Gould's great contention is that "the body is just as much a part of the environment as the world itself," or even more so, and that bodily excellences and defects exercise a profound influence upon the developing mind; and by mind he uncompromisingly means an immaterial spiritual entity and not the mere function of the brain cells. Darwinian biologists stop at the influence of the world on the body, Gould goes a step further.

It is to be hoped that more such studies will be made and a scientific explanation given as to why we are what we are. Criminals should not be the only ones studied. They have occupied the center of the stage long enough, and anyhow half or more of them are perfectly normal men, who as children have been buffetted by adversity or even taught to be criminals. But every extraordinary man is worthy of study to find why he is extraordinary. Hearn is merely one. His abilities and deficiencies are only exaggerations of the powers and weaknesses of the average man. Shyness, for instance, is always accompanied by bitter animosities due to the sufferer's inability to find out the real conditions at first hand. Misunderstandings disappear by personal discussions. Nor are the sensual characteristics more than the exaggerations of normal emotions, and seem mild in comparison to what is known of those of transcendent genius. Nor can we say that such men are unhappy, for that is a condition with a million standards—they live their lives and apparently love life as much as the gilded youth or the denizen of the slums.

There is entirely too much repetition in the book, which would be more forceful in a scientific sense if much contracted, but that would destroy its literary value for it is a monument to Gould's remarkable command of words. It is a book well worth while, for it will introduce the reader to some of the beauties of Hearn's works, which unfortunately are not yet popularized. There is an excellent bibliography and that most unusual thing—a long chapter of appreciations and epitomes of Hearn's work.

C. E. W.

Veterinary Pathology. By PROFESSORS FRANZ FRIEDBERGER and EUGEN FRÖHNER. Translated by M. H. HAYES, F. R. C. V. S. With notes on Bacteriology by PROFESSOR R. TANNER HEWLETT, M. D., F. R. C. P., etc. Sixth edition (revised and enlarged). $8.00 net. (*Chicago: W. T. Keener & Co., 1908.*)

Every up-to-date veterinarian is acquainted with Friedberger and Fröhner. Until the publication recently of Hutyra and Marek's exhaustive text-book (originally issued by the authors in both the Hungarian and German languages), the work of Friedberger and Fröhner was an absolute necessity in the library of the veterinarian, public sanitarian and student of comparative medicine. Given a pre-eminent place among the Germans, such prominent French veterinarians as P. J. Cadiot and J. N. Ries esteemed it highly enough to give their countrymen in 1891-1892 an authorized translation from the second German edition. In 1895 there appeared in this country an unauthorized English translation, based largely upon the French work of Cadiot and Ries. Of questionable value then, Zuill's translation is now entirely out of date, having been made at the best only from the third German edition of the original work. Thus there was little that could appeal to the English reader until the appearance of Law's five-volume Practice (1896-1903).

In 1898 appeared the first installment of an authorized translation of Friedberger and Fröhner, by Captain M. H. Hayes, widely known among English veterinarians as a keen observer and incisive writer upon a great number of veterinary topics. This Volume I, entitled Infectious Diseases, was superseded in 1904 by a second edition based upon the fifth (1900) German edition. Its companion volume, on the Non-infectious Diseases of Animals, appeared in 1905, under the editorship of John Dunstan, M. R. C. V. S., this change being made necessary by the sad fact of Capt. Hayes' death.

Capt. Hayes' widow, Mrs. Alice Hayes, now submits to the pub-

lic what she is pleased to call an "exact, authorized translation of the sixth edition of Professors Friedberger and Fröhner's Veterinary Pathology." In performing this task, Mrs. Hayes has seen fit to return to the arrangement of volumes and chapters that exists in the German work.

Three qualifications are necessary in a translator of a work of this kind: a thorough acquaintance with the language in which the original work was written, a perfect control of the language into which the work is translated and a familiarity with the science unfolded in the work. These qualifications are displayed in this translation in a most marked and pleasing way. Not once does the technical language blunder or mar the rhythm of a sparkling and fascinating English that never fails to do full justice to every German thought or word.

Stop! That last statement must receive one qualification, and herein the reviewer proves his title by playing the part of critic. One solitary exception requires to be made. On page 261 of Volume II, under Cholera and Plague of Birds, we read, "Next to diphtheritic inflammation of the mucous membrane, chicken cholera is the most important and most common disease of poultry." In the same volume, page 416, under Diphtheria of Fowls, we find, "Speaking generally, this form is, next to typhoid, the most common and most dangerous epizootic among fowl." It must be understood here that fowl typhoid and fowl cholera are the same disease. Now, what the German does say, page 251, sixth edition, is this, "Fowl cholera along with (*neben*) fowl plague (*Hühnerpest*) and the diphtheritic inflammation of the mucous membrane the most important and most frequent epizootic of poultry, was, so it is stated, known in ancient times." Page 403, of the same German edition, is correctly rendered by the second translation above given. According to Hayes, Friedberger and Fröhner contradict themselves by saying in one place that next to fowl diphtheria, fowl cholera is the most common; while in another place they say that next to fowl cholera (typhoid), fowl diphtheria is the most common. The difficulty is that the translator has used an identical English expression, "next to," for the two German words, "*neben*" and "*nach*," apparently forgetting that the "next to" of "*neben*" means beside, along with, together with. The "next to" of "*neben*" denotes association; the "next to" of "*nach*" implies order, gradation. One is disposed to say with Horace, "Aliquando bonus dormitat Homerus." Some considerable familiarity with both the original and the translation leads to the conclusion that this form of inaccuracy is a solitary instance.

It is to be hoped that there is but a single instance, also, of another inaccuracy that occurs in the first quoted passage. We are told, as quoted above, that this is "an exact . . . . translation of the sixth edition." Now, as a matter of fact, the opening sentence under "Cholera and Plague of Birds" is a translation of the fifth edition, but not of the sixth edition. The fifth edition associates cholera and diphtheritic inflammation in importance and frequency; the sixth edition adds *Hühnerpest* to the group. In view of the fact that the article on *Hühnerpest*, which appeared first in the sixth edition, has its proper place in the translation, one cannot but think that this is only another instance of Homeric nodding.

The work suffers, as such works are likely to suffer, by its failure to present, in the form of editorial editions, certain of the important advances in medicine which have taken place between the writing of the original work and the making of the translation. A notable instance occurs in the article on rabies. One is surprised in reading a book with the 1908 imprint to find that positive diagnosis of rabies is to be made only by inoculation methods. In 1900 Van Gehuchten and Nélis announced their discovery of a diagnostic lesion occurring in the cells of the cerebrospinal axis. The sixth edition of the German work was issued in 1904 and contains a note on this rapid method of diagnosis by finding the protoplasm of the nerve cells invaded by new-formed cells, and also the observation of other investigators that this lesion occurred only in animals dying of the disease. Citing Bohl's finding of this lesion in cases of distemper, Friedberger and Fröhner conclude that "the histological diagnosis is, accordingly, not more reliable than the dissection." Later researches have demonstrated that although this lesion is not a specific diagnostic lesion, having been found in distemper and meningitis, it is, nevertheless, a constant lesion in cases of rabies that are permitted to die.

However, the just described rapid method of diagnosis has been superseded very largely by another based upon a discovery announced in 1903 by A. Négri and since fully confirmed by numerous investigators. This is the demonstration in certain nerve cells, particularly in the horn of Ammon, of peculiar, round or oval, non-granular, eosinophilic bodies, now known as Négri bodies. For nearly, if not quite, two years prior to the publication of this translation, rapid diagnosis by Négri bodies had become the routine practice in many laboratories. For this reason it would seem that such an important practice and the grounds for it should, of necessity, receive mention by the translator.

The physician or health officer relying upon this translation for his ready information as to reliable methods of rapid diagnosis of rabies would be sadly behind the times, to the possible danger of the patient or the severe condemnation of official action. When, as has happened in this case, a translation appears on the very eve of the publication of the next edition of the original work, the editor of the translation can hardly be excused for omitting the mention of certain important facts that he knows will assuredly be given a place in that new edition.

The same criticism must be passed upon the article on "Hog Cholera." In 1905, De Schweinitz, Dorset and McBryde, of the U. S. Department of Agriculture, announced their discovery of a filterable virus of hog cholera. The great benefit of this discovery lies in the ability thus secured to develop a successful serum treatment and prophylaxis. Previous to 1908, the date of this translation, there had been confirmation of this discovery in England, Austria, Germany, South Africa and France. In the annual report for 1905, of the Board of Agriculture and Fisheries, are given results of investigations carried on by Stockman, chief veterinary officer of Great Britain, and McFadyean, principal of the Royal Veterinary College, confirming this work of the Bureau of Animal Industry, and noting the finding of a filterable virus in the blood of pigs suffering from swine fever (English name for hog cholera) in the various parts of the United Kingdom.

On page 245, in describing the bacillus of hog cholera, "*entfärbt sich*" is unfortunately translated by "is stained by," instead of "is decolorized by" Gram's method.

"Veterinary Pathology" is a title accurately characteristic of the work. It is frequently remarked by veterinarians that pathology is the strong point of Friedberger and Fröhner. This characteristic, however, is never at the expense of other necessary features, as, for instance, etiology, symptoms, treatment. To anthrax are accorded forty-one pages, two of which are devoted to a thoroughgoing historical review of the disease. Comparative pathology is placed before the reader with great clearness and detail, and this makes the work of such inestimable value to others than veterinarians. The reviewer honestly believes that the critic's work is really exhausted in mentioning the few points to which attention is called above. When those have been dealt with there is left nothing but praise for the splendid work of Friedberger and Fröhner and the equally splendid Hayes' translation. Because of the great value of this book it is to be hoped that a new edition of the translation may be speedily forthcoming in which appear all the additions of the new seventh German edition.

Diseases of the Digestive Canal (Œsophagus, Stomach and Intestines). By DR. PAUL COHNHEIM. Second edition edited and translated by DAVID FULTON, M. D. (*Philadelphia and London: J. B. Lippincott Company, 1909.*)

We feel that this work should prove of really great value to the general practitioner and to the medical student. The lack of definite and specific knowledge of the diseases of the digestive apparatus is a most striking characteristic of many of the most active practicing physicians. Their stay in the medical school and hospital has taught them much about the diagnosis of pneumonia, typhoid fever, diseases of the cardiac, renal and respiratory apparatus and the exanthemata, while giving them a great admiration for the variations in human metabolism dependent upon abnormalities of the internal secretions, upon various parasites and upon variations from the normal of the cerebro-spinal apparatus. When the physician gets out into the world to practice his science and his art he is appalled by the infrequency with which he is called upon to treat myxœdema, exophthalmic goitre and Addison's disease, and even, comparatively speaking, typhoid fever and pneumonia, and with what persistency patients tell him of the ills of their stomachs and intestines, begging for light to lighten the darkness of these inaccessible regions. Cohnheim's book is peculiarly suited to the great mass of physicians to whom these unfortunate souls come for advice, groping in the darkness wherein diseases of the stomach and intestines have been immolated from time immemorial, wherein nervous dyspepsia has been the usual diagnosis and some placebo, in which, as a rule, an alkali and a bitter are eternally blended, the all-curing remedy. To such unfortunates this little book will furnish light, perhaps only a glimmer, if their previous condition of servitude has been appalling, perhaps rays possessed of real illuminating qualities. This is eminently a practical work. The literature is not reviewed; pathological details and theoretical discussions are eliminated, and everything is done to present the subject briefly, succintly, yet in a manner thoroughly comprehensible, to one who has not had especial training in this subject. It is practically an exposition of Cohnheim's own views on the diagnosis and treatment of gastro-intestinal diseases gained in his private and polyclinic experience, and written from the view-point of the general practitioner, for the author is not a stomach specialist, but a member of the humble former class. Cohnheim lays especial stress upon thorough and rational anamnesis; in fact, he feels that from this and the ordinary general physical examination a good working diagnosis can be made in a great majority of cases. We feel that this is going too far, and that it is most advisable to insist upon the chemical, physical and microscopical analysis of the test meal in the case of gastric diseases, and of the fæces in intestinal diseases, especially as these procedures are comparatively simply done, require little time, and unquestionably add considerably to the correctness of the diagnosis. Cohnheim very well insists upon the importance of a thorough examination of all the internal organs, and the central nervous system, and calls especial attention to a fact very often forgotten that many cases regarded as diseases of the gastro-intestinal apparatus are in reality due to disease elsewhere, and vice versa. The two main portions of the book, the one devoted to diseases of the stomach, the other to those of the intestines, are each subdivided into two main sections, a general section and a special section; under the former, Cohnheim considers the anamnesis with the different subjective symptoms, the methods of physical examination, particularly palpation and the chemical and microscopical methods of examination, while under the latter the organic or anatomic local diseases, the functional disorders, such as atony, neuroses, etc., and the symptomatic disorders secondary to diseases of other organs. These larger chapters are preceded by a short discussion of diseases of the œsophagus, and followed by brief outlines of balneotherapy, electrotherapy, diet, massage, mechanotherapy, etc., of use in gastro-intestinal diseases. A clinical A. B. C. of the most important disturbances of the digestive tract gives in six pages the salient signs and symptoms, and the appropriate treatment of these diseases. The book, although containing less than 400 small pages, gives such a satisfactory practical survey of the field, especially as regards diagnosis, without the use of elaborate methods and treatment along comparatively simple lines, that we feel we can thoroughly recommend Cohnheim's work to the general practitioner, in the firm belief that it will prove of the greatest service to him and to his patient in obtaining a better appreciation of these most common and yet poorly understood diseases.

T. R. B.

A Text-Book of General Bacteriology. By EDWIN O. JORDAN, Ph. D., Price, $3.00. (*Philadelphia: W. B. Saunders Company, 1908.*)

This text-book of Dr. Jordan's on bacteriology has already, even in the short space of time since it appearance, proved a valuable work for students and a reference book of great accuracy for advanced investigators in this subject. Written by one whose primary training was along the lines of general and hygienic bacteriology, rather than the purely medical side of the science, the book takes up the subject in a much broader way than do the majority of text-books written by medical men who look upon bacteria purely from the point of view of the harm they can do the human organism. Therefore, such matters as the bacteriology of air, soil, milk and water have received adequate treatment, while one entire chapter is devoted to "bacteria and the nitrogen cycle," and another to the bacterial diseases of plants. At the same time the purely pathogenic bacteria are well and accurately described—the description of their cultural characters and the means of differentiating closely allied species being especially good. Throughout the entire volume the references to literature are to be highly commended, a number of early investigations being cited, which are not mentioned in the average text-book. Considerable attention is paid the pathogenic trichomycetes and pathogenic protozoa, while the chapter on immunity is to be commended for its brevity and its presentation of facts, not theories. We have already had the opportunity of using the book in the class-room and most cordially recommend it to all students and investigators in this field.

W. W. FORD.

Infant Feeding. A Practical Guide to the Artificial Feeding of Infants. By J. S. FOWLER, M. D., F. R. C. P. (Oxford Medical Publications. *London: Henry Frowde and Hodder & Stoughton, 1909.*)

This little book consists of a recasting of a series of lectures delivered in connection with the Class of Diseases of Children in the University of Edinburgh and to members of the Edinburgh Post-Graduate Courses. It contains explicit directions for the feeding of infants and is a very readable book, containing as it does many of the personal views of the author. In the consideration of the composition and digestion of milk, especial stress is laid on the value of clean milk and methods to be used in obtaining it. Feeding of the normal infant is carefully considered and the various methods used by other authors briefly mentioned. The more important causes of failure are discussed and the feeding of some of the more important diseases considered. Many of the truths concerning infant feeding are very well put; for example the opening sentence: "The signs of successful artificial feeding are, first, a normal development, and, in particular, gain in weight; second, absence of digestive troubles; third, freedom from rickets and other nutritive disorders towards the end of the suckling period." Fowler does not believe in pasteurization, but prefers simply boiling or sterilizing in some form of sterilizer.

He is a great believer in sterile milk and deplores the prevailing opinion that raw milk is superior in any form to sterilized milk. In considering the subject of the caloric value of foods, he very wisely calls attention to the fact that a food may yield an abundance of calories, but may be unsuitable otherwise, and that it is not possible to get more information from a caloric standard than will answer the question: Is the infant being supplied with enough energy or fuel? It is also pleasing to note that the true value of intelligent care of the baby has been properly estimated, a point which has been much overlooked in recent publications on infant feeding. Taken as a whole the book should prove very useful to the student and very interesting to the expert. J. R.

BOOKS RECEIVED.

Constipation and Intestinal Obstruction (Obstipation). By Samuel Goodwin Gant, M. D., LL. D. With 250 original illustrations. 1909. 8vo. 559 pages. W. B. Saunders Company, Philadelphia and London.

Frühdiagnose und Tuberkulose-Immunität unter Berücksichtigung der neuesten Forschungen: Konjunktival- und Kutan-Reaktion, Opsonine, etc., speziell der Therapie und Prognose der Tuberkulose. Von A. Wolff-Eisner. Mit einen Vorwort von Geh. Med. Rat Prof. Dr. H. Senator und Geh. Med. Rat Prof. Dr. A. Wassermann. Zweite vermehrte Auflage. 1909. 4to. 378 pages. Curt Kabitzsch (A. Stuber's Verlag), Würzburg.

Censo de la República de Cuba. Bajo la Administración Provisional de los Estados Unidos 1907. Director, Victor H. Olmsted; Subdirector, Henry Gannett; Jefe de Inspección, José de J. Monteagudo. 1908. 8vo. 707 pages. Oficino del Censo de los Estados Unidos, Washington.

The Faith and Works of Christian Science. By the Writer of "Confessio Medici." 1909. 12mo. 232 pages. The Macmillan Company, New York.

A Text-Book of Special Pathology. By J. Martin Beattie, M. A. (N. Z.), M. D. (Edin.) and W. E. Carnegie Dickson, M. D., B. Sc., F. R. C. P. (Edin). With 191 illustrations and 2 colored plates from original preparations. 1909. 8vo. 599 pages. P. Blakiston's Son & Co., Philadelphia.

City of New York. Department of Public Charities. Annual report for the year ending December 31, 1907. 4to. 649 pages. Martin B. Brown Press, New York.

Transactions of the American Electro-Therapeutic Association. Seventeenth annual meeting held at Boston, Mass., September 17-19, 1907. 8vo. 164 pages. 1908. A. L. Chatterton & Co., New York.

Elementary Practical Treatise on Diseases of the Pharynx and Larynx. By Dr. E. J. Moure. Translated and adapted by J. Malcolm Farquharson, M. B., F. R. C. P. (Edin). With 210 illustrations. 1909. 8vo. 403 pages. Rebman Company, New York.

A Manual of Practical X-Ray Work. By David Arthur, M. D., D. P. H. and John Muir, B. Sc., M. B., Ch. B. and B. Sc. (Pub. Health). With about 120 illustrations. 1909. 8vo. 244 pages. Rebman Company, New York.

The Theory of Ions. A Consideration of its Place in Biology and Therapeutics. By William Tibbles, M. D. (Hon. Causa), Chicago, LL. D., L. R. C. P. E., M. R. C. S., L. S. A., etc. 1909. 12mo. 131 pages. Rebman Company, New York.

Severest Anæmias. Their Infective Nature Diagnosis and Treatment. By William Hunter, M. D. (Edin.). Volume 1. With Historical Schemes, Charts and Plates. 1909. 8vo. 226 pages. Macmillan & Co., Limited, London.

Transactions of the New York Obstetrical Society. Volume for 1908. Reprinted from the American Journal of Obstetrics. [1909.] 8vo. 243 pages. William Wood & Co., New York.

Annual Report of the Surgeon-General of the Public Health and Marine-Hospital Service of the United States. For the Fiscal Year 1908. 8vo. 220 pages. 1909. Government Printing Office, Washington.

William Osler, Lehrbuch der Internen Medizin. Aus dem Englischen übersetzt und für deutsche Verhältnisse ergänzt und bearbeitet von Priv.-Doz. Dr. Edmund Hoke. Mit einem Vorwort von Obersanitätsrat und Hofrat Prof. Dr. R. v. Jaksch. 38 Abbildungen. 1909. 8vo. 879 pages. Urban & Schwarzenberg, Berlin und Wien.

Pratique de la Chirurgie Antiseptique. Leçons Professées a l'Hotel-Dieu. Par le Docteur Just Lucas-Championnière. Avec un Portrait de Lord Lister. 1909. 8vo. 463 pages. G. Steinheil, Paris.

The Medical Annual: A Year Book of Treatment and Practitioner's Index. Twenty-seventh Year. 1909. 8vo. 911 pages. John Wright & Sons, Ltd., Bristol. Simpkin, Marshall, Hamilton, Kenk & Co., Ltd., London.

Infant Feeding. A Practical Guide to the Artificial Feeding of Infants. By J. S. Fowler, M. D., F. R. C. P. Ed. 1909. 12mo. 230 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Report of Committee on Social Betterment. By George M. Kober, M. D., LL. D. 1908. 8vo. 281 pages. The President's Homes Commission, Washington, D. C.

Industrial and Personal Hygiene. By George M. Kober, M. D., LL. D. 1908. 8vo. 175 pages. The President's Homes Commission, Washington, D. C.

Report of Committee on Building of Model Houses. By George M. Sternberg, M. D., LL. D. 1908. 8vo. 111 pages. The President's Homes Commission, Washington, D. C.

Report of the Committee on Improvement of Existing Houses and Elimination of Insanitary and Alley Houses. By William H. Baldwin. [1908.] 8vo. 23 pages. The President's Homes Commission, Washington, D. C.

Report to the Government of British Honduras upon the Outbreak of Yellow Fever in that Colony in 1905. With an Account of the Distribution of the Stegomyia Fasciata in Belize, and the Measures Necessary to Stamp out or Prevent the Recurrence of Yellow Fever. By Rubert Boyce, M. B., F. R. S. 1906. Fol. 104 pages. Waterlow & Sons, Limited, London.

Études Anatomo-Cliniques. Cœur-Vaisseaux-Poumons. Parle Dr. Raymond Tripier. Avec 32 figures dans le texte. 1909. 8vo. 604 pages. G. Steinheil, Paris.

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TUBERCULIN TREATMENT AMONG DISPENSARY PATIENTS.

By Louis Hamman, M. D.,
Associate in Medicine, The Johns Hopkins University,

AND

Samuel Wolman, M. D.,
Assistant in Medicine, The Johns Hopkins University.

In the last five years a great deal has been written about the care of tuberculous patients in their homes, and the success that follows such a method of painstaking treatment even amongst the poor. During the past two years we have had in the Phipps Dispensary of the Johns Hopkins Hospital constantly under our control a group of from thirty to fifty patients, whose mode of life has been strictly supervised. In addition they have been treated with tuberculin, and it is this feature of the work that we wish particularly to emphasize. There is a widespread reawakening of interest in tuberculin treatment, and although we have followed generally recognized methods of procedure we have thought that it might not be without interest to tell how their application has succeeded in the dispensary. Whatever the ultimate verdict about the value of tuberculin may be we believe that much of the evidence should come from its use among outpatients. A dispensary has some advantages over a sanatorium which should not be neglected, and although many difficulties must be overcome they are by no means insurmountable. What we have to say is no proof of the value of tuberculin in the treatment of pulmonary tuberculosis nor is it even an argument in favor of its use. We have of course acquired certain impressions which we do not hesitate to state, but they are only impressions. What we believe we have shown is that tuberculin may be used on a large scale in the dispensary without danger and under the most satisfactory control.

The Selection of Patients.

As tuberculin treatment requires much time and care we have up to the present been able to extend its use to only a small number of the patients who come to the dispensary. These have been selected according to definite requirements. A degree of intelligence is essential, and many lack even this small range. Willingness to undergo a long and often tedious cure and faithfulness and dependability in carrying out instructions must be considered. A certain amount of home comfort, too, and enough leisure to allow regular attendance at the dispensary are demanded. These particulars have been our guide in the selection of the patients and not the stage or extent of their disease. We have taken early, moderately advanced and far advanced cases and a few who were evidently on the last leg of their downward course. The response of the patients has been on the whole satisfactory. Some, after a short period of treatment, have left as the result of conflicting demands that they considered more urgent, and a few were discharged on account of hopeless indifference. In any group of patients one is bound to have a few trifling malcontents who breed general dissatisfaction, but the morale of the group has been readily re-established by their summary dismissal. Everything is done to impress the patients with the important bearing their earnestness and faithfulness will have on the success of the treatment. From their own records largely we must judge of their progress and be guided in the treatment, and these are the object of particular review and surveillance.

The Control of Patients.

When a patient is selected for treatment with tuberculin he is referred to the visiting nurse, who schools him in taking his temperature and pulse and explains the method of recording his symptoms and the main features of his daily life. In the beginning blank note books were used, later books similar to the ones used by Pratt, of Boston (Mass.), which were

Date:							
Temperature - - 8 A. M.							
12 N.							
4 P. M.							
8 P. M.							
Pulse - - - - - 8 A. M.							
12 N.							
4 P. M.							
8 P. M.							
Weight:							
Tuberculin: Dose							
Place of Injection: Pain							
Swelling							
Enlarged Glands							
Symptoms: Appetite							
Digestion							
Nausea							
Vomiting							
Headache							
Chilliness							
Pain in Joints							
Sleep							
Nervousness							
Strength: As usual							
Increased							
Decreased							
Cough: As usual							
Increased							
Decreased							
Sputum: As usual							
Increased							
Decreased							
Blood in Sputum							
Pain in Chest							
Shortness of Breath							
Rest: In Bed							
Sitting down							
Exercise							
In open air							
Diet: Milk							
Eggs							
Oil							
Total gain in weight							

This facsimile is two-thirds of the actual size.

modeled after those of Miner, of Asheville (N. C.), and in the past eight months special record books modified from those used by Brown in the Adirondack Cottage Sanitarium. The accompanying specimen sheet illustrates their scope. They have proved satisfactory and compact, each book of twenty-five pages lasting six months. On the inside of the cover the following directions are printed:

Now that you are to begin to take tuberculin it is important that you pay the greatest attention to keeping this record carefully and conscientiously. Whether we increase or decrease the amount of tuberculin you are receiving will depend entirely upon how you have stood the preceding dose and the only way we can judge of this is from the record you keep. Your improvement depends then to a large extent upon the faithfulness with which you keep your record. Never put down a temperature unless you are sure of it, and never make any entry until you are sure that you understand the book.

Each page in this book will keep your record for a week.

As you see, there are seven columns. Put the date at the top of the column and make a note after each symptom in the space immediately opposite it. You fill in each space every day, except the "tuberculin" space, which the doctor will fill in. After each symptom, if you have it, make a + mark. If you haven't it, make a 0. After "appetite," "digestion," "sleep" write "good" or "poor" as may suit the case. Under the heading "rest" write how many hours spent in bed, how many resting in a chair. In filling in the number of hours spent in the open air include those spent in bed if you sleep on a porch or with your windows out. Under "diet" put down the number of pints of milk, the number of eggs and the number of tablespoonfuls of oil. If you have any symptom, no matter how trivial it may seem to you, which is not in this book tell the doctor about it at your next visit.

From the time of this preliminary conference to the end of the treatment the nurse is the essential factor in the successful control of the patient. The records are simple and their management usually grasped after a single explanation, but in the beginning continuous vigilance is necessary to avoid often surprisingly gross errors. After a few weeks' supervision there is no longer any difficulty.

The following day the nurse visits the patient in his home and becomes intimately acquainted with his surroundings and mode of life. After a study of the possibilities the necessary changes are gradually instituted. If there is a porch or an available roof to support a balcony the patient is urged to take advantage of the opportunity for sleeping out of doors. If this plan is not feasible the room with the best exposure is selected for the patient and the windows removed. This is not only a wholesome lesson but it admits the greatest possible amount of air and the patient cannot offer innumerable excuses for having the windows down. In Baltimore nearly all houses have shutters which may be closed during a heavy rain.

If the patient has fever he is kept in bed until the temperature becomes normal, although in a few instances, where it was unusually refractory, injections have been begun in spite of a slight daily rise. During the treatment whenever the temperature becomes elevated the patient is again kept in bed until it subsides.

Although the importance of rest is impressed upon each patient, and the necessity of being at rest in the open air during the day as well as at night, it has in most instances been impossible to insist upon absolute quiet. Most of the women under our care have been obliged to assist in home duties and upon many has fallen the whole burden of the household. Some of the men too have worked more or less constantly throughout the whole period of treatment.

As a routine it is required that each patient, especially upon beginning treatment, take two quarts of milk and from two to four eggs a day, although the expense has prevented some from following our directions. In many instances from one to two ounces of olive oil are added, at least until the

normal weight is established. Towards the end of treatment, if the patient has progressed satisfactorily, he is allowed to resume his usual dietary, although a liberal diet is encouraged.

No routine medication has been used during the period of treatment with tuberculin. A tonic of gentian and nux vomica or the elixir of the phosphates of iron, quinine and strychnine was occasionally prescribed in the hope of stimulating appetite, and a few of the patients have taken a little heroin or codein to control excessive cough.

Upon beginning treatment the patients are visited by the nurse every day or every second day, as the circumstances demand. Later, after they are satisfactorily trained, a weekly visit usually suffices, although some are visited oftener and a few particularly reliable patients not so often. Throughout our work the Charity Organization Society has given invaluable aid by supplying food and other necessities to the patients and their families.

The Selection of the Tuberculin.

In the beginning of our work we used old tuberculin. Principally because it was the preparation most generally used, and because we had gained some experience with it in making diagnostic injections. Later we have also used new tuberculin T. R., and more recently the simple unheated filtrate, the B. F., of Denys. We cannot help but feel that more importance has been laid upon the choice of tuberculin than the matter deserves. There is every evidence now for believing that the potency of all tuberculin depends upon the same substance and that all act in just the same way. There is no essential difference between the action of the filtrates and the action of the ground-up bodies of the tubercle bacillus or the action of various extracts of the bacilli. Wolff-Eisner[1] has given evidence to show that even the filtrates depend for their efficacy upon minute portions of the bodies of the bacilli. There is a profusion of writing treating learnedly of the antitoxic action of the filtrates and the antibacterial action of the bacillary emulsions, but there is absolutely no scientific foundation to support such views. Immunity to one kind of tuberculin carries with it immunity to all tuberculins. Nor is there any more sound evidence to lead us to believe that certain extractions rid the preparation of toxic and reaction-producing substances, while the immunizing portion is obtained in a pure condition.[2] What is toxic in tuberculin and causes reactions is the very substance with which we hope to stimulate immunization and a preparation can be made harmless only by ridding it of this substance when it becomes inert. It would seem unnecessary to state that the tubercle bacillus excretes no soluble toxin as the tetanus and diphtheria bacilli do, but in face of the loose ideas that prevail it is a point that deserves emphasis. Of course certain preparations may have advantages which make them more suitable for use from a practical standpoint. For instance it has been said that reactions come more unexpectedly and are more prolonged when bacillary emulsions are used than in treatment with the filtrates. If this be true one might easily explain it upon physical grounds, as it may be difficult to get absolutely uniform suspensions of tubercle bacilli or coarse particles of their ground-up bodies. The claim that the unheated filtrate produces reactions which are more abrupt and less enduring than those following the use of other preparations lacks confirmation.

Following the lead of Spengler a great deal of attention has been paid to the source of tuberculin. This has now narrowed down to interest in the respective tuberculins from human and bovine cultures. Spengler[3] claims that tuberculin from bovine bacilli can be used more satisfactorily in the treatment of infections with the human bacillus and tuberculin from human cultures in bovine infections. As it is now generally granted that two more or less distinct types of the tubercle bacillus exist it may be possible that some slight differences are present which make, under certain conditions, one more easily borne than the other. Upon the assumption of such a difference Detre[4] has devised an ingenious diagnostic method based on the sensitiveness of an infected individual to the two tuberculins as shown in the cutaneous reaction. There is absolutely no analogy between the varying effects of tuberculin from these two sources and the immunization of cattle to bovine infection with human bacilli. Pottenger[5] has offered some striking observations in favor of Spengler's views. His cases are so remarkable that similar results from other observers are to be earnestly desired. A number of our patients who were not taking satisfactorily tuberculin from a human culture were put on bovine tuberculin. No marked difference in tolerance was noted. Indeed there was certainly less difference than in a few cases where a change was made from one form of human tuberculin to another. Two patients who seemed unable to tolerate even small amounts of O. T., when put upon B. F. took without any difficulty increasing doses. This may have been a coincidence; certainly we can offer no satisfactory explanation for it.

Method of Preparing the Dilutions and of Giving the Injections.

Our dilutions are made so that each bottle is one-tenth as strong as the preceding number. Number 1 is the pure tuberculin; number 2, 9 cc. diluent and 1 cc. tuberculin; number 3, 9 cc. diluent and 1 cc. of number 2, etc. The diluent is 0,8 per cent salt solution with 0,25 per cent carbolic acid. This scheme is simple and very convenient, as the number of the bottle represents the number of figures one must write to express the amount of tuberculin in each cc. Thus bottle five contains 0,000,1 gm. tuberculin to each cc., bottle, seven 0,000,001 gm. per cc., etc. The dilutions are

[1] Frühdiagnose und Tuberkulose Immunität. Würzburg, 1909.

[2] Klebs (Virchow's Archiv, 1907, Vol. 190, Beiheft, p. 134) and v. Ruck (Ztschr. f. Tuberkulose, 1906, Vol. VIII, p. 377) have prepared such extracts. They were, too, the basis of the claims made by v. Behring at the International Tuberculosis Congress, Paris, 1905.

[3] Deutsche med. Wchnschr., 1905, Vol. 31, pp. 1228 and 1353.

[4] Wiener klin. Wchnschr., 1908, Vol. XXI, p. 173.

[5] J. Am. M. Ass., 1909, Vol. 52, p. 1007.

made in wide-mouthed, glass-stoppered bottles and are kept in a refrigerator when not in use. The salt solution must be carefully prepared with distilled water and pure sodium chloride. If any impurities are present they may cause endless annoyance by producing a flocculent precipitate which does not become evident until after twelve to twenty-four hours. If the pipettes, bottles and syringes are sterilized there is no danger of contamination. Fresh dilutions are prepared every two weeks. We have been unable to note any change in strength during this period.

Injections are made *subcutaneously* under the skin of the back in the region of the angle of the scapula, varying from right to left. We wish to emphasize subcutaneously because it has been prominently stated [6] that the injections should be made deeply into the muscle. The most delicate guide we have to tuberculin intolerance is the reaction at the site of the injection and it is important that this be where we can see it and feel it. For making the injections we have used syringes devised by the Randel-Faichney Company. These have a narrow bore of 1 cc. capacity divided into hundredths. Of course one cannot measure accurately 0,01 cc., but one can 0,05 cc. Preparatory to injection the skin of the back is cleaned with alcohol. No dressing is applied. In making over 5,000 injections we have never had the slightest infection.

The Principles of Tuberculin Treatment.

Before beginning tuberculin treatment it is important to have clearly in mind just what one purposes to accomplish. With few exceptions the general aim has been to produce a high grade of tolerance to tuberculin. Wright [7] has sought to introduce scientific methods in tuberculin treatment by attempting to measure the effect of each injection and so regulate its size and interval. His studies have led him to advocate small doses and the repetition of the same dose rather than to attempt producing tolerance by increasing doses. Without offering any discussion of Wright's views, it may be pointed out that the results of Moss [8] and the conclusions of the special committee from Oxford and Cambridge Universities [9] throw doubt upon the accuracy of his method; and it may be suggested that the whole of tuberculosis immunity is not contained in phagocytosis. Wright's work has received little support from clinical workers and the older method of producing tuberculin tolerance is the one still in general use. Nearly everyone who uses tuberculin proceeds in a manner a little different from others, but the methods may be conveniently divided into two groups. Those in the first group, whose views are represented by Löwenstein,[10] Roepke and Bandelier,[11] Schlossmann [12] and others, make it their essential aim to reach a high grade of tuberculin tolerance in the shortest possible time. Löwenstein determines the sensitiveness to tuberculin by diagnostic injections and then begins with the dose, or a slightly smaller dose, than the one liberating a reaction and rapidly increases the amount. The essential points about his method are to avoid giving small doses, and after once beginning treatment never to retreat to smaller amounts. If a patient gives a severe reaction repeat the dose until there is no longer a reaction, and if a mild reaction occurs, the dose may still be increased. It is claimed that by giving small doses and particularly by giving small doses repeatedly such a high grade of hypersensitiveness is developed that it becomes impossible to proceed with any degree of satisfaction to large amounts of tuberculin. Schlossmann, working among infants, begins with a dose that causes a reaction and then ascends with almost incredible rapidity to large amounts. In a child 12 months old he began with 0,000,1 gm. old tuberculin and in 60 days repeated this dose 30 times, producing 28 reactions. Another child 10 months old received 0,000,1 gm. twice, then 0,001 gm. eight times; after the sixth injection, no longer a reaction. Then 0,002,5 gm. once and 0,005 gm. five times, 0,01 gm. three times, 0,05 gm. five times; after the fifth injection no longer a reaction. Then 0,1 gm. three times and 0,5 gm. four times. After a month's pause the child showed a definite reaction to 0,1 gm. This dose was repeated three times, then 0,2 gm. once, then 1 gm. five times, after which there was no longer a reaction. Then 2 gm. five times. Later the child received 5, 10 and even 20 gm. Apparently the injections were made every second day. In another instance he advanced from 0,001 gm. to 2 gm. in three weeks.

Bandelier and Roepke occupy a position between the two groups. Perhaps it might be better to classify them in the second. They urge the repetition of the same dose after mild reactions and encourage a retreat after severe reactions. However, they begin with doses much higher than those used in the mild method and do not urge the same extreme caution in avoiding even slight reactions.

The second group is represented notably by Trudeau,[13] Denys [14] and Sahli.[15] While they aim to produce as high a grade of tuberculin tolerance as possible, the reaching of high doses is not their ultimate object. They believe that treatment should be begun with a dose so small that no reaction will be produced and the dose steadily advanced, but so slowly and so cautiously that no reaction will occur. The essential feature of this method, then, is to avoid the occurrence of any reaction, even mild ones, and to carry the individual patient only as high as his tolerance will permit, and rather to suspend treatment than to force him beyond this measure. The greatest care is exercised to discover the

[6] Bonney: Pulmonary Tuberculosis, etc. W. B. Saunders Co., 1908.

[7] Lancet, Lond., 1905, Pt. II, p. 1598.

[8] Johns Hopkins Hosp. Bull., 1907, Vol. 18, p. 237.

[9] A Report of the Committee for the Study of Special Diseases from Oxford and Cambridge Universities.

[10] Handbuch der Technik u. Methodik d. Immunitätsforschung. Kraus u. Levaditi, Vol. I, p. 821.

[11] Lehrbuch der Specifischen Diagnostik u. Therapie der Tuberkulose. Würzburg, 1908.

[12] Deutsche med. Wchnschr., 1909, Vol. 35, p. 289.

[13] Am. J. M. Sc., 1906, Vol. 132, p. 175.

[14] Le Bouillon Filtré. Louvain, 1905.

[15] Ueber Tuberkulin Behandlung. Basel, 1907.

earliest symptoms of susceptibility, and when they occur the dose is either reduced or carried along at the same level until they disappear.

There are many questions which are brought up for consideration by these two methods, but notably the question of hypersensitiveness and of the advisability of producing reactions.

As is well known, patients with tuberculosis, except under special conditions, have a marked sensitiveness to tuberculin, and this sensitiveness is the basis of all of the specific methods of diagnosis. The reaction is not due to tuberculin itself, for tuberculin is absolutely non-toxic in non-infected individuals. This is demonstrated by the very large amounts that may be given healthy infants with impunity.[16] The hypersensitiveness to tuberculin is different too from the hypersensitiveness developed after an injection of albumen, inasmuch as no number of repeated tuberculin injections will produce hypersensitiveness in a non-infected animal. Indeed it would seem that hypersensitiveness to tuberculin occurs only when living organisms have grown in the animal body.[17] Tuberculin itself is, then, not a toxic substance, and a reaction following its introduction into the body must be due to some newly-formed toxin. Marmorek[18] supposes that it stimulates the tubercle bacilli to produce their real toxin, which is quite different from tuberculin itself. The local phenomena at the point of application is a strong argument against such a view. It is more commonly considered that the tuberculin itself is split up by antibodies which act as ferments (v. Pirquet,[19] Vaughn[20]) or as lysins (Wolff-Eisner[21]), and that in the process of disintegration the toxic substance is liberated. It is to this newly-formed toxin that the cells become hypersensitive. The whole phenomenon of hypersensitiveness no doubt represents a protective reaction of the body. The remarkable local phenomena following the application of tuberculin to any part of the body of a tuberculous patient illustrates how alive the cells have become to a protective response. Animals with tuberculosis, as Roemer[22] has so beautifully shown, possess a very remarkable grade of immunity to renewed infection, but they cannot successfully combat the disease that has once become established.

While this hypersensitiveness is a protective reaction it is also the cause of the fever and general constitutional symptoms which accompany tuberculous infection.

There may be two indications for tuberculin treatment. Certain isolated foci of disease may be cut off from the general circulation and so little of the specific material be absorbed that no defence reaction is produced by the body. It seems reasonable to assume that the healing of such foci may be hastened by artificially stimulating this reaction. Here hypersensitiveness would be a valuable asset. Such a condition, however, would exist but rarely in pulmonary lesions. Far more commonly, there is too much absorption and the symptoms of such absorption are manifest. It is in the hope of combating these symptoms that tuberculin is given. As the tolerance for tuberculin increases, the body loses its susceptibility as well to the toxin absorbed from the disease in the lungs. Nothing is more striking in tuberculin treatment, when increasing doses are tolerated, than the great improvement in the symptoms usually spoken of as toxic. What we aim to accomplish is to render the body insensitive to the influence of the toxins absorbed so that it may be vigorous and in health, in spite of the existence of the tuberculous focus. We then hope that it will be in better condition to bring about healing of the lesion. This is certainly what practical experience would induce us to believe. Under tuberculin treatment symptoms frequently disappear and nutrition improves in a remarkable manner. It is a long time before there is a noticeable change in the character of the lesion. Of course, tuberculin does more than influence the phenomenon of hypersensitiveness. If we are to believe Wright, phagocytosis is increased. The agglutinating power of the serum is certainly raised. These processes may be of the greatest importance in destroying the tubercle bacillus and in inducing healing of the lesion.

This process of immunization is an active one. Tuberculin itself is not a curative agent. It is useful only in stimulating a response from the body, and if the body cannot respond, it does no good and may even be harmful. The mechanism by which tolerance for tuberculin is acquired we cannot satisfactorily explain. It is probable that the body cells themselves do not become insensitive.* Wasserman,[23] by complement absorption experiments, thought he could demonstrate anti-tuberculin in the blood of treated patients. While it is certain that this substance is not an antitoxin in the same sense that animals treated with diphtheria toxin produce an antitoxin, it is possible that the toxic portion split off by the disintegration of tuberculin may find a binding substance in the blood. Wolff-Eisner[24] suggests that certain tissues and organs may develop receptors which hold the tuberculin or the split-off toxin and prevent it reaching important organs.

Hypersensitiveness to tuberculin may be stimulated artificially by the repeated injection of small amounts of tuberculin and notably by producing a reaction to tuberculin. Löwenstein[25] was the first to lay stress on its importance in diagnostic injections. We[26] have shown in numerous charts how the fifth of a milligram, which on the first administration produced no appreciable change, may give rise to an

[16] Hamburger: München. med. Wchnschr., 1908, Vol. LV, p. 1220.

[17] Baldwin (Yale M. J., Feb., 1909) gives a good review of this subject. He suggests that hypersensitiveness to tuberculin differs in degree but not in kind from that to other albumens.

[18] Arch. gén. de méd., 1903, Vol. 192, p. 2945.

[19] Wiener med. Wchnschr., 1907, No. 28.

[20] J. Infect. Dis., 1907, Vol. IV, p. 476.

[21] Loc. cit.

[22] Beiträge z. Klinik d. Tuberkulose, 1908, Vol. XI, p. 79.

* At least they do not in diphtheria toxin immunization, as Behring has shown in his paradoxical reaction.

[23] Deutsche med. Wchnschr., 1906, Vol. XXXII, p. 449.

[24] Loc. cit.

[25] Ztschr. f. Tuberkulose, 1904, Vol. 5, p. 485.

[26] Hamman: Archiv. Internal Med., June, 1908.

intense reaction after the second, third, fourth or fifth injection. Koch, himself, has formulated it as an essential principle in tuberculin diagnosis that when a given dose has produced a reaction ever so slight, this same dose should be repeated before ascending to larger amounts. Such a repetition is almost constantly followed by a severe reaction. After frequent repetitions the reaction may become milder and milder, and finally fail to appear. However, Schlossmann, as previously quoted, obtained 28 successive reactions following the administration of the same dose. We have never had the courage to make such repeated injections, but Charts Nos. 1 and 2 illustrate how each of the successive reactions to the same dose becomes more severe than the previous one. We know that Löwenstein and Bandelier and Roepke show charts where a reaction does not occur when the same dose is repeated and then rapidly raised. We have had such instances too, but in our experience they are distinctly the exception. When during treatment reactions occur, especially to high doses, one has practically always come to the point where the dose must be decreased, or if the patient is to be forced onward, it must be done at the expense of entailing at least several, and often many severe reactions. This brings us to a consideration of the value or harmfulness of tuberculin reactions.

It will be remembered that the reaction was an important part of the immunizing process first outlined by Koch in tuberculin treatment, and even in later publications he has never completely relinquished the idea of its importance. However, it was this feature that largely contributed to bringing the treatment into discredit. With the experience of this early tuberculin era before us it seems incredible that Schlossmann's methods could gain general acceptance. To all appearances his cases showed marked and unusual improvement, but it is hardly possible that such a procedure could be of general applicability, especially in pulmonary tuberculosis. It is indeed more than likely that even after small doses which cause no appreciable effects, mild focal reactions occur. These may be observed when the tuberculous lesion is situated externally. That such mild reactions may be beneficial is not unreasonable. The increased blood-flow and slight inflammatory reaction may bring the processes of immunization to act more satisfactorily upon the lesion. These mild reactions are, however, not those to which reference is made. It is the severe reactions, and particularly the prolonged and repeated reactions, to which we have reference.

Our own experience has unquestionably influenced us strongly to look upon these as undesirable. While it is true that some patients progress favorably in spite of numerous reactions, many suffer appreciably in their general condition. Most observers agree, too, that profound focal reactions are, to say the least, not advantageous. Such marked increase in the area of physical signs as exhibited by the patient from whose records Chart No. 2 is constructed cannot be interpreted as indicating an active advancement of the disease. We know how insufficient our methods of examination are, and how far short they fall of giving us a true picture of the extent of the pulmonary lesion. Without question this patient had disseminated tubercles throughout the right lung before the reactions occurred. The râles developed merely as an expression of the inflammatory reaction about these tubercles. Is such a reaction desirable? We appreciate that this question is not one to be answered off-hand. But the marked depreciation in the general health of these patients, their slow and tedious recovery and the obstinate persistence of the physical signs have impressed us as decidedly unfavorable. We have never had the courage to force such patients to higher doses in spite of the repeated reactions. It certainly cannot be said that by using small doses and avoiding all reactions it is impossible to carry patients to a high grade of tuberculin tolerance. The method is longer and more tedious than Löwenstein's apparently is, but the object is frequently attained just as surely and certainly more smoothly.

The Method of Producing Tuberculin Tolerance.

Our experience then has forced us to adopt the mild method of inducing tuberculin tolerance. While each patient must be studied individually and his susceptibility be made the guide of the size and increase in dose, we have developed a plan to which we more or less closely adhere. The first requisite for a successful management of cases is to have a wholesome respect for even the smallest doses of tuberculin. In the beginning of our work we made 0,000,001 gm. the initial dose, but as many patients showed reactions in the thousandths of a milligram, it was later reduced to 0,000,000,1 gm. and even to 0,000,000,01 gm. We are now, however, beginning to individualize. Patients in good general condition with an inactive lesion may be started at 0,000,001 gm., while those with symptoms of absorption from the tuberculous area are started on smaller doses. Remembering that the whole process of tuberculin treatment depends for success on an active response of the infected body, we have sought to bring the patients to as satisfactory a condition of general health as possible before beginning injections. When there is fever or the patients' general nutrition has suffered, they are put to bed until there is sufficient improvement. Indeed, three or four weeks in bed is an excellent preparation for any patient beginning tuberculin treatment. During this time, too, they became acquainted with proper record-keeping. After a start has once been made an increase in dose will depend upon how the preceding one has been borne. In the small doses each succeeding one may be doubled, but when we reach the thousandths and hundredths of a milligram advancement should be more cautious. In these larger doses we in the beginning increased by decimals; thus, 0,000,01, gm., then 0,000,02 gm., then 0,000,03 gm., etc. At a glance it is seen how irregular such a scheme is. From one to two is doubling the dose, from 9 to 10 is only a one-ninth increase. It was noted too that most reactions occurred in the first decimals, where the jumps are largest. To obviate this inconsistency one may insert an extra dose between one and two and between two and three, and at the end of the scale jump from five to seven and from seven to ten. This plan

has long been in use by Brown, of Saranac (N. Y.), and more recently he has devised logarithmic tables which allow a regular increase in the dose. They give the method greater accuracy but are a little cumbersome; and as a patient's response can by no means be measured mathematically, the simpler plan, cautiously used, is satisfactory. In the smaller doses we have given injections twice a week; after ten milligrams is reached, only once a week.

As the all-important feature of the method of tuberculin treatment here outlined is the avoidance of reactions, it is essential to consider the signs of developing intolerance. A reaction to tuberculin consists of four essential features: a rise of temperature, constitutional symptoms, a local reaction at the site of injection and a focal reaction. In a typical reaction all four are present but each may occur in the absence of the others and in any combination of two or three out of the four. Without question the most delicate and the most constant sign of approaching intolerance is the local reaction.

The local reaction consists of swelling and redness at the site of injection. The patient usually complains of pain and tenderness. A little tenderness when leaning against the point is the most common complaint. It is, however, a matter of the greatest importance that a considerable local reaction may occur without the patient making any complaint or even when denying its presence when questioned. An injection should never be given without first making a careful examination of the point of previous injection. When there has been a reaction a definite nodule of infiltration can usually be felt, but when the reaction is slight it may be necessary to pick up folds of skin on corresponding portions of the body before the infiltration can be appreciated. We have the impression that exceptionally a febrile reaction may occur in the absence of a local reaction; but in the last eight months, during which time we have paid especial attention to the association, we have seen no general reaction which was not preceded by a local reaction after a previous injection. We are indebted to Denys for calling our attention to this point so forcibly. Chart No. 3 is a good illustration of it.

Constitutional symptoms also frequently occur before a febrile rise. The patient must, however, be carefully questioned to elicit these. They are seldom striking. A feeling of lassitude and slight general malaise, loss of the usual bodily vigor, mental depression, restlessness, digestive disturbances and notably a continuous loss of weight may all be indicative of intolerance. These symptoms are tabulated in the record books and the patient cautioned to observe them carefully. It is indeed frequently difficult, in a nervous patient, to determine whether certain ill-defined symptoms depend upon tuberculin. As one learns the disposition and character of a patient, however, one soon comes to a correct estimate of his complaints. We have never seen a neurotic, introspective patient depressed or harmed by record-keeping. It seems indeed to give them a diverting occupation and to offer a support against their vacillation.

A reaction at the site of the lesion may be manifested by symptoms or by signs. Pain in the chest, dyspnea and increased cough and expectoration are the characteristic symptoms. These may occur independently of any relation to tuberculin, but their presence demands caution. Much less commonly there is an increase in the number or extent of the râles. Any marked change in the physical signs we have never observed except following an outspoken febrile and constitutional reaction.

Experience has taught us that with careful observation of the point of injection and of the patient's symptoms, febrile reactions rarely occur. It is, however, of importance that the slightest elevation of temperature—one of even a few fifths—should receive careful consideration. As we have previously stated, if these go unobserved, the following injection will almost certainly liberate a more intense reaction. (See Charts Nos. 1, 2, 3, 4, 5, 6 and 7.) It is at times a question of the greatest difficulty to decide if tuberculin is responsible for a particular temperature elevation. We know how common it is for patients with pulmonary tuberculosis to have temporary flare-ups of fever when they are not being treated with tuberculin. Such elevations may have all the characters of a tuberculin reaction artificially produced, and indeed are essentially the same thing. Intercurrent infections too must be considered. The latter group are as a rule easily distinguished. Charts Nos. 8 and 9 show the fever from tonsilitis; Chart No. 10 from grip; Chart No. 11 from syphilis. No definite decision can be made in some instances belonging to the first group. Denys refuses to consider any temperature elevation as due to tuberculin which comes on more than 48 hours after the injection. It is characteristic of tuberculin reactions that the rise is abrupt even though the fall may be irregular and prolonged. A fever coming on with step-like progression, so that the fastigium is not reached until the third or fourth day, is unlikely to be due to the tuberculin injection. We have become so impressed with the almost constant appearance of a local reaction to injections preceding the ones liberating a general reaction that we would hesitate to ascribe an elevation coming suddenly in the midst of a perfectly smooth tuberculin treatment and unaccompanied by a local reaction, to the injections, provided, of course, that the dose has not been unduly increased. Charts Nos. 12 and 13 show such questionable febrile reactions.

Being acquainted with the symptoms and signs of tuberculin intolerance, what should be our behavior when they arise? When there has been a slight febrile reaction to a small dose unaccompanied by marked constitutional symptoms, it often happens that when the dose is repeated once or several times no further reaction occurs and we can then rapidly ascend. This is particularly true of the small doses given at the beginning of the cure. Charts Nos. 14, 15 and 16 illustrate this. However, it does not always succeed, as Charts Nos. 17 and 18 show. When we have reached larger doses this method is seldom practicable. Charts Nos. 1 and 2 show how the sensitiveness is not only maintained but even increased.

After a moderately severe or a severe reaction we should allow from ten to fourteen days to elapse after all symptoms

of the reaction have subsided and then begin with much smaller doses. Since we have given special attention to the site of injection such reactions have been exceedingly rare. If a local reaction follows an injection the same dose is repeated. This repetition is continued until no local reaction occurs before going to higher doses. If the local reaction becomes more severe to subsequent injections, or if a mild febrile reaction follows, the dose is decreased and then again cautiously raised. By this method we frequently come to a point beyond which it seems impossible to carry the patient and it is here that the greatest demand is made upon our patience and perseverance. Chart No. 19 shows such a condition and here is a case that illnstrates the point:

Dispensary No. 2162. Mamie F., white female, age 19, single. Onset of illness in August, 1907. Was run down and during a vacation "caught cold." Had cough, weakness and loss of appetite. Came to Dispensary November 9, 1907, complaining of severe cough and weakness. Family history negative and no history of exposure. Had lost 9 pounds.

Examination.—Temperature 100° F., pulse 130, respiration 22, weight 109 lbs. Pale, frail girl; eyes sunken; poorly nourished.

Lungs.—Right: Note impaired to third rib and behind to angle of scapula; breath sounds diminished in intensity with tubular quality above and below clavicle and in supraspinous fossa. Moist râles on quiet breathing to second rib; after coughing to fourth rib, and behind to angle of scapula. Left: Note impaired less markedly than on right above and below clavicle and in supraspinous fossa; more marked dullness at extreme base behind. Breath sounds harsh at apex and at base. Few fine moist râles above and below clavicle and at base behind. Mucopurulent sputum with tubercle bacilli.

On January 3, 1908, O. T. begun with injection of 0,000,000,1 gm. Dose was gradually raised and several slight reactions occurred in the hundredths of a milligram, necessitating a return to 0,000,005 gm. on June 26, 1908. Dose again raised until, on October 13, she received 0,000,4 gm.

1908

Oct. 20. O.T. 0,000,5 gm.; no fever; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,000,6 " no fever; no local pain or swelling; no constitutional symptoms.
27. O.T. 0,000,8 " no fever; marked local swelling although patient made no complaint of it; no constitutional symptoms.
30. O.T. 0,001 " temperature to 101.6° F.; some cough and general malaise; no local swelling.
Nov. 13. O.T. 0,000,1 " no fever; no local pain or swelling; no constitutional symptoms.
17. O.T. 0,000,2 " no fever; no local pain or swelling; no constitutional symptoms.
20. O.T. 0,000,3 " no fever; no local pain or swelling; no constitutional symptoms.
27. O.T. 0,000,4 " no fever; no local pain or swelling; no constitutional symptoms.
Dec. 1. O.T. 0,000,5 " no fever; no local pain or swelling; no constitutional symptoms.
4. O.T. 0,000,6 " no fever; marked local pain and swelling; no constitutional symptoms.
8. O.T. 0,000,8 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
11. O.T. 0,000,8 gm.; no fever; some local tenderness; no constitutional symptoms.
15. O.T. 0,000,8 " no fever; no local pain or swelling; no constitutional symptoms.
22. O.T. 0,000,8 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
29. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.

1909

Jan. 5. O.T. 0,002 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
8. O.T. 0,002 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,002 " temperature to 99° F.; marked local swelling and redness; no constitutional symptoms.
15. O.T. 0,001 " temperature to 99° F.; slight local swelling and redness; no constitutional symptoms.
19. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
22. O.T. 0,001 " caught a "cold"; temperature on 25th 99.4° F.
Feb. 2. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
5. O.T. 0,001 " temperature to 99° F.; moderate local swelling; indigestion.
9. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,001,5 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,001 " temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
Mar. 1. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
5. O.T. 0,001,5 " temperature to 99.2° F.; no local pain or swelling; no constitutional symptoms.
9. O.T. 0,001,5 " no fever; no local pain or swelling; no constitutional symptoms.
12. O.T. 0,002 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
19. O.T. 0,002 " temperature to 99.4° F.; no local pain or swelling; no constitutional symptoms.
23. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
26. O.T. 0,001,5 " no fever; swelling at site of injection and of previous injection; no constitutional symptoms.
30. O.T. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.
April 2. O.T. 0,001,5 " temperature to 99.2° F.; some local swelling; no constitutional symptoms.
6. O.T. 0,001 " temperature to 99.8° F.; no local pain or swelling; no constitutional symptoms.

From beginning of treatment to February 12, 1909, patient gained 17 lbs; but during period of hypersensitiveness, with many slight reactions, she lost 4¾ lbs. Patient's general condition has greatly improved, and nearly all the symptoms have subsided. Sputum on June 9, 1908, was negative, and she has had no sputum since then. Râles have disappeared on the left side, and are less numerous and not so extensive on the right.

By selecting a dose just short of the one to which the patient reacts and repeating this dose indefinitely, or by returning to a smaller dose and gradually increasing, we are usually able to overcome this hypersensitiveness.

The following case is illustrative:

Dispensary No. 3127. Maud R., white female, age 28, single. Has had cough, always worse in winter, for three years. Two years ago had four or five hemoptyses; maternal grandmother and one brother and one sister have died of pulmonary tuberculosis. Patient lived at home while brother and sister were sick. Came to dispensary July 21, 1908, complaining of cough and expectoration.

Examination.—Temperature 98.8° F., pulse 92, respiration 16, weight 115¼ lbs. Fairly well nourished, good color, does not look ill.

Lungs.—Right: Note impaired above and below clavicle and behind to fourth dorsal spine; breath sounds above clavicle tubular, below harsh and interrupted, in supraspinous fossa rather suppressed with tubular quality; after cough a few moist râles above and below clavicle. Left: Note a little impaired above clavicle and in supraspinous fossa; breath sounds rather harsh; few fine râles above clavicle after cough. Cutaneous and conjunctival reactions positive. No tubercle bacilli found in sputum.

Tuberculin treatment begun August 18, 1908, with 0,000,000,1 gm. bouillon filtrate. Dose was then uneventfully raised until October 27, 1908.

1908			
Oct. 27.	B.F. 0,000,004	gm.;	temperature to 99° F.; marked local swelling; no constitutional symptoms.
Nov. 6.	B.F. 0,000,001	"	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
10.	B.F. 0,000,001	"	no fever; no local pain or swelling; no constitutional symptoms.
13.	B.F. 0,000,002	"	no fever; no local pain or swelling; no constitutional symptoms.
17.	B.F. 0,000,003	"	no fever; no local pain or swelling; no constitutional symptoms.
20.	B.F. 0,000,004	"	no fever; no local pain or swelling; no constitutional symptoms.
24.	B.F. 0,000,005	"	no fever; no local pain or swelling; no constitutional symptoms.
27.	B.F. 0,000,006	"	no fever; no local pain or swelling; no constitutional symptoms.
Dec. 1.	B.F. 0,000,008	"	no fever; no local pain or swelling; no constitutional symptoms.
4.	B.F. 0,000,01	"	no fever; no local pain or swelling; no constitutional symptoms.
8.	B.F. 0,000,015	"	no fever; no local pain or swelling; no constitutional symptoms.
11.	B.F. 0,000,02	"	no fever; some local soreness and swelling; no constitutional symptoms.
15.	B.F. 0,000,02	"	no fever; slight local soreness; no constitutional symptoms.
18.	B.F. 0,000,02	gm.;	no fever; no local pain or swelling; no constitutional symptoms.
22.	B.F. 0,000,03	"	no fever; no local pain or swelling; increased cough.
29.	B.F. 0,000,04	"	temperature to 99° F.; slight local soreness; no constitutional symptoms.
1909			
Jan. 2.	B.F. 0,000,04	"	temperature to 99° F.; no local pain or swelling; "biliousness."
5.	B.F. 0,000,05	"	temperature to 99° F.; slight soreness and swelling; no constitutional symptoms.
8.	B.F. 0,000,05	"	no fever; slight local pain; no constitutional symptoms.
12.	B.F. 0,000,07	"	no fever; marked local pain and swelling; no constitutional symptoms.
15.	B.F. 0,000,06	"	temperature to 99° F.; slight local pain; no constitutional symptoms.
19.	B.F. 0,000,05	"	temperature to 99.8° F.; no local pain or swelling; no constitutional symptoms.
22.	B.F. 0,000,05	"	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
26.	B.F. 0,000,07	"	no fever; local pain and swelling; no constitutional symptoms.
29.	B.F. 0,000,07	"	temperature to 99° F.; local pain and swelling; no constitutional symptoms.
Feb. 2.	B.F. 0,000,06	"	temperature to 98.8° F.; local pain and swelling; no constitutional symptoms.
5.	B.F. 0,000,06	"	no fever; slight local pain; no constitutional symptoms.
9.	B.F. 0,000,07	"	no fever; no local pain or swelling; no constitutional symptoms.
12.	B.F. 0,000,08	"	temperature to 99.4° F.; local pain and swelling; headache and general malaise.
23.	B.F. 0,000,01	"	no fever; no local pain or swelling; no constitutional symptoms.
26.	B.F. 0,000,02	"	no fever; no local pain or swelling; no constitutional symptoms.
Mar. 2.	B.F. 0,000,03	"	no fever; no local pain or swelling; no constitutional symptoms.
5.	B.F. 0,000,04	"	no fever; no local pain or swelling; no constitutional symptoms.
9.	B.F. 0,000,05	"	temperature to 98.8° F.; slight local pain and swelling; no constitutional symptoms.
12.	B.F. 0,000,05	"	no fever; no local pain or swelling; no constitutional symptoms.
23.	B.F. 0,000,07	"	no fever; no local pain or swelling; no constitutional symptoms.
26.	B.F. 0,000,09	"	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
30.	B.F. 0,000,1	"	no fever; no local pain or swelling; no constitutional symptoms.
April 2.	B.F. 0,000,2	"	temperature to 99° F.; no local pain or swelling; no constitutional symptoms.
6.	B.F. 0,000,4	"	no fever; no local pain or swelling; no constitutional symptoms.

13. B.F. 0,000,7 gm.; no fever; no local pain or swelling; no constitutional symptoms.
16. B.F. 0,001 " no fever; no local pain or swelling; no constitutional symptoms.

Patient's general condition has improved very much. She now has no symptoms and has gained 26½ lbs. The râles have disappeared.

Here is the essential difference between the mild and the more abrupt methods of tuberculin administration. When we have reached the height of the patient's tolerance we quietly wait rather than force them on to higher doses through repeated reactions. And the question may be put if we are not accomplishing all that tuberculin can do by thus remaining just below the reacting-point? Certainly there is no clinical evidence to show that these patients do not progress as satisfactorily as those going uninterruptedly to the highest doses. Their general condition continues to improve, or at least remains stationary, and there is no aggravation of the physical signs, which is more than we can say of some of the patients whom we tried to force on in spite of reactions. It is important too to emphasize not only that intercurrent infections call for interruption of tuberculin treatment but that they also heighten sensitiveness. It is not enough to allow time for complete recovery before again beginning treatment, but the treatment should be taken up at a much lower dose.

With the method as here outlined it is often possible to carry patients without a break in the plan to very high doses. The point that we should aim to reach is empirical, but we have never gone beyond one gram. Having reached this dose we have in some patients repeated it over months, at intervals of one or two weeks. We have made no particular point, however, about reaching this amount. We have stopped at the dose where reactions threatened further advance. After even a year of treatment some patients have not been over 0,1 gm. and many even lower than this. Occasionally one will find it impossible to get beyond the smallest amounts, in spite of every effort. One patient during ten months of treatment never received over 0,000,009 gm., and another during thirteen months never over 0,000,009 gm. While occasionally a marked improvement will occur under even these small doses repeatedly given, as a rule patients showing such unusual hypersensitiveness fail to respond with the usual amelioration of symptoms and improvement in the nutrition.

Tuberculin tolerance or immunity must not be confounded with tuberculosis immunity. Not only is it possible for the original lesion to spread while the patient's general condition improves under tuberculin treatment, but even when large doses are tolerated the disease may break out in other organs. One of our patients developed tuberculous laryngitis after doses of twenty and thirty milligrams had been successfully reached.

An unpleasant experience leads us to give one important caution. As it is impossible to satisfactorily standardize tuberculin, the same product from different laboratories varies in strength and indeed the same product from the same laboratory may vary in preparations made at different times. If during treatment it becomes necessary to change from the tuberculin of one culture to that of another the greatest caution should be observed in the first few injections to test the patient's tolerance. In the instance to which we refer, a patient was receiving 400 mg. of B. F. when it became necessary to use the B. F. of another laboratory. The patient was given 400 mg. of the product and a very violent reaction ensued.

Cases Suitable for Tuberculin Treatment.

The most satisfactory results from tuberculin are attained among early cases. It must be admitted that early cases respond best to any form of treatment, and in them the value of tuberculin can be determined only by the durability of the results. The most striking improvement is seen in certain moderately and far advanced cases who, under general hygienic-dietetic treatment, have experienced some amelioration of their symptoms, but who have then for months remained stationary. The following case is an instance:

Harry T., white male, age 32, single, brass polisher and plater. Came to dispensary September 4, 1906, complaining of bronchial trouble. Illness began fourteen months before with a "cold." Had fever and night sweats, but was not ill enough to be confined to bed. Ever since then he has been coughing, and has grown weaker. He has lost about six or seven pounds in weight. Has been constantly under treatment and unable to work during this time.

One sister died of tuberculosis when patient was eleven years old and he was intimately associated with her.

Examination.—Temperature 98° F., pulse 70, respiration 26, weight 129¾ pounds. Fairly well nourished. but looks pale and ill. Scars on left side of neck from glands which broke down five years ago. Marked limitation of movement of whole left side.

Lungs.—Right: Note a little impaired above clavicle and in supraspinous fossa; inspiration harsh and expiration a little blowing; no râles. Left: Note impaired down to second rib, and to angle of scapula behind. Breath sounds diminished in intensity over the whole side; tubular quality above and below clavicle and in interscapular area. Numerous fine and medium moist bubbling râles over nearly the whole side, and a few sibilant and sonorous râles. Numerous fine superficial crackling râles throughout the axillary region; only a small number of râles below the angle of scapula.

Heart and Abdomen.—Nothing remarkable.

From September to February patient came regularly to dispensary and apparently followed directions, but there was no special improvement in his condition. He was still sallow and ill-looking. Was still coughing and had gained but a few pounds in weight. On February 8 tuberculin treatment was begun with 0,000,001 gm. O. T. After a few weeks, patient began to show a great improvement in his general appearance and his cough too began to improve.

When treatment was stopped on June 26, 1908, patient weighed 171 pounds, and was a picture of robust health.

On admittance sputum examination was negative. Tubercle bacilli were found on May 3, 1907. Two later examinations were again negative, and since May, 1908, he has had no sputum to bring for examination.

The physical signs exhibited changes which might be interpreted as indicating beginning fibrosis. The râles grew progressively less moist and bubbling in character. After having been

away from work for over three years the patient returned to his previous occupation of brass plating. He has now been steadily at work for eight months and has had no return of symptoms. His weight has gradually dropped to 156 pounds, a loss that was to be expected after taking up active employment.

It is futile to expect patients with rapidly progressing disease and marked constitutional symptoms to react favorably to tuberculin. The patient must be offering some resistance to his disease before we can hope that tuberculin will stimulate such resistance. Fever of a mild grade, when other conditions are favorable, need not be a contraindication to treatment. Indeed a slight continuous fever may satisfactorily subside after injections of small doses. Where tuberculin is particularly indicated is in the early stages of pulmonary disease and in those patients in good or fair general condition with sluggish, moderately or far advanced lesions. The latter group comprises those patients who will show the most brilliant results.

Results of Treatment.

The total number of patients that received the tuberculin treatment is 112. But this report deals only with those who were under treatment at least 90 days—a group of 71 cases. These 71 cases have been analyzed in Table I, and classified according to condition on admission, conformably to the nomenclature of the National Association for the Study and Prevention of Tuberculosis.[27] However, only 57 of the cases lend themselves to this classification, the remaining 14, which we label "probable," being patients in whom the diagnosis of pulmonary tuberculosis cannot be made with assurance, although they present very suggestive signs and symptoms. These 14 probable cases were treated in every way as if they were positively tuberculous, and we are gratified to report that whatever may have been the cause of their symptoms and signs, they all improved as regards these symptoms, and in a fair number, the suggestive physical signs, too, vanished. While the remainder of the report deals mainly with the 57 cases which we regard as definitely tuberculous, yet data concerning the 14 "probable" cases will often appear.

The classification on discharge conforms strictly to the definitions established by the National Association. It is well to recall, here, that the class marked "progressive" (worse), on discharge, therefore includes not only those patients who were actually worse, but those too who had not changed, and also those in whom the physical signs alone had not changed, although there was manifest and even marked improvement in the symptoms.

Table II presents the results of treatment in the classes grouped according to condition on admission, and further subdivided according to the presence or absence of tubercle bacilli in the sputum. The 57 cases comprise 13 incipients, 16 moderately advanced, 28 far advanced, of which 4 incipients, 6 moderately advanced, 25 far advanced, a total of 35, show tubercle bacilli in the sputum. On account of the difficulty we experienced in making sufficiently numerous sputum examinations in our large ambulant clinic, the number of negative cases is largely due rather to our negligence than to the absence of bacilli.

Of the 57 cases, 10 were apparently cured, 16 were arrested, 12 were improved, 18 were progressive, 1 died (a far advanced case).

Of the 18 progressive cases, 4 improved as regards symptoms, 10 were unchanged as regards symptoms, and only 4 were worse as regards symptoms (all 4, far advanced cases).

Of the 13 incipients, only 1 was progressive; of the 16 moderately advanced 2 were progressive; of the 28 far advanced 16 were progressive (1 died).

Table III shows the average gain in weight on the basis of condition on admission and at discharge. As was to be expected, the moderately advanced cases—those that have lost a considerable amount of weight, and yet are not too far advanced to improve—show the largest increase. On the basis of results, note the wide gap between the progressive cases and all the rest. The average gain in weight for the entire group is 6½ pounds. The maximum gain in weight is 41 pounds (Case 2 in Table I—a far advanced case). Among those that lost weight are three apparently cured cases.

Table IV shows the average maximum dose of tuberculin per class. For the entire group it is 0,005 gm. It is seen that the early cases and those that do well take the largest dose. The largest dose that we have ever administered is 1.0 gm. This was attained by Cases 7 and 46. In this connection we present a compilation based on the figures given by L. Brown in the Twenty-fourth Annual Report of the Adirondack Cottage Sanitarium. It is remarkable that his apparently cured cases have attained such a low maximum dose.

Table V shows the average number of days and doses required to attain the maximum dose. It seems that the far advanced and progressive cases reach their limit of tolerance early. That is, they soon attain a dose beyond which it is impossible to force them without unpleasant consequences. That this early attainment of the maximum dose is not due simply to a briefer total period of treatment is seen from Table VI, which presents the average duration of treatment in days, and the average total number of doses. This table suggests that the duration of treatment is based rather on the progress of the case than on its condition at the beginning of treatment.

Table VII shows the average number of days intervening between two successive doses. This period seems to be much alike in all the cases and suggests that our prudence consisted rather in the regulation of the dose than on its occasional omission.

Table VIII gives the average number of reactions during the entire period of treatment, and Table IX shows after how many doses and after how many days a reaction may be expected in the various classes. Those two tables agree in showing that the number of reactions depends rather on the condition when admitted than on the result of treatment, and furthermore that the far advanced cases show the greatest number of reactions.

[27] L. Brown: J. Am. M. Ass., 1909, Vol. LII, p. 241.

TABLE I.

Prepared in accordance with the suggestions of the National Association for the Study and Prevention of Tuberculosis.

No. Sex Age	Condition		Extent of Physical Signs (Turban) Both Lungs	Extent of Physical Signs (Turban) Each Lung	Duration of Disease	General Condition	Digestion	Weight Actual	Weight Standard	Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B.	T. B. Previous	T. B. Residence	Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
1 M., 17	On Admis'n At Disch'rge	Far Adv. Progress.	III III	R³ R³ L³	4 months 11 months	Favorable Favorable	Unimpaired Unimpaired	128 141	125	75-102 76- 90	98.6 98.8	+ O		O	O O	O. T. .050 45 doses 220 days
2 M., 32	A D	Far Adv. Arrested	III III	R¹ L³ R¹ L³	19 months 36 months	Favorable Favorable	Unimpaired Unimpaired	130 171	136	90-100 72- 80	98.1 97.9			+	O O	O. T. .090 } 108 doses, T. R. .000001 } 504 days
3 M., 19	A D	Far Adv. Progress.	II III	R¹ L² R² L²	15 months 25 months	Unfavorable Unfavorable	Unimpaired Unimpaired	117 116½	125	84- 92	99.2 98.5	O		+	Fistula in Ano " " "	O. T. .00004 } 62 doses, T. R. .000001 } 257 days
4 F., 19	A D	Mod. Adv. Improved	II II	R² L R² L	84 months 93 months	Favorable Favorable	Unimpaired Unimpaired	113¼ 131¼	135		98.5 99			O	O Tub. Laryngitis	O. T. .060 } 68 doses, } 328 days
5 F., 17	A D	Far Adv. Arrested	III III	R³ R³	16 months 31 months	Unfavorable Favorable	Unimpaired Unimpaired	89½ 116¾			98 98.4	+		+	O O	O. T. .350 } 83 doses, T. R. .000001 } 470 days
6 M., 22	A D	Mod. Adv. Progress.	II III	R² R³	22 months 24 months	Favorable Favorable	Unimpaired Unimpaired	119 127	120	87-103 89-102	98.8 99		+		O O	O. T. .000002 13 doses, 77 days
7 M., 52	A D	Incipient Arrested	I I	R R	25 months 40 months	Favorable Favorable	Unimpaired Unimpaired	137 140	145	90-116 69- 76	98.4 98	O			O	O. T. 1.0 T. R. .000001 76 doses, 455 days
8 F., 31	A D	Incipient Ap. Cured	I	R	6 months 16 months	Favorable Favorable	Unimpaired Unimpaired	126 140	124	68- 82	98.9 99	O			O	O. T. .02 65 doses, 312 days
9 F., 22	A D	Incipient Improved	I I	R R	14 months 29 months	Favorable Favorable	Unimpaired Unimpaired	98 102	120	98-104 98-116	98.6 99.3			+	....	O. T. .06 T. R. .0001 71 doses, 450 days
10 M., 31	A D	Far Adv. Arrested	III III	R¹ L³ R¹ L³	18 months 26 months	Favorable Favorable	Unimpaired Unimpaired	132 142	132	80- 86 80- 89	98.8 98.8			+	Tuberculous Laryngitis	O. T. .08 46 doses, 240 days
11 F., 33	A D	Far Adv. Improved	III III	R² L² R² L²	41 months 51 months	Favorable Favorable	Unimpaired Unimpaired	99 103	110	60- 88 86- 90	98.4 99			+	Secondary Lues	O. T. .06 T. R. .000001 71 doses, 295 days
12 M., 45	A D	Mod. Adv. Arrested	II II	R² L R² L	21 months 32 months	Favorable Favorable	Unimpaired Unimpaired	158 163	150	84- 84 86- 88	98.2 98.2			O	O	O. T. .050 T. R. .000001 74 doses, 345 days
13 F., 33	A D	Probable Probable	I	R	72 months 87 months	Favorable Favorable	Unimpaired Unimpaired	116 114	100	70- 80 74- 78	98.5 98.5	O			O	O. T. .45 T. R. .000001 75 doses, 450 days
14 F., 27	A D	Incipient Improved	I I	R L R L	60 months 73 months	Favorable Favorable	Unimpaired Unimpaired	160 178	175	72- 84	98.4 99			O	O	O. T. .000009 61 doses, 390 days
15 M., 41	A D	Mod. Adv. Ap. Cured	II	L²	6 months 15 months	Favorable Favorable	Unimpaired Unimpaired	147 148		80- 87 88- 92	98 98.4	O		O	O	O. T. .055 60 doses, 270 days
16 F., 34	A D	Incipient Ap. Cured	I	R L	6 months 19 months	Favorable Favorable	Unimpaired Unimpaired	117 137	132		98.1 98	O		O	Neurasthenia	O. T. .02 79 doses, 392 days
17 F., 18	A D	Incipient Ap. Cured	I	R	8 months 12 months	Favorable Favorable	Unimpaired Unimpaired	132 126	125	84-100 88- 96	98.6 98.6				....	O. T. .150 31 doses, 118 days
18 F., 16	A D	Incipient Progress.	I I	R L R L	10 months 13 months	Favorable Favorable	Unimpaired Unimpaired	154 148	135	72- 92 80- 96	98.6 98.8				O	O. T. .0006 14 doses. 88 days
19 F., 35	A D	Far Adv. Improved	III III	R¹ L³c R¹ L³c	19 months 29 months	Unfavorable Unfavorable	Unimpaired Unimpaired	111 121		80- 96	99 99.4	+		+	O	O. T. .001 T. R. .000001 55 doses, 305 days
20 M., 21	A D	Far Adv. Progress.	III III	R¹ L² R¹ L²	16 months 30 months	Favorable Favorable	Unimpaired Unimpaired	142 155	154		98.8 98.6			+	O	O. T. .1 T. R. .000001 102 doses, 418 days
21 M., 27	A D	Mod. Adv. Ap. Cured	II II	R² L R² L	96 months 110 months	Favorable Favorable	Unimpaired Unimpaired	130 134	138	78- 99	97.8 Bel. 99			+	O	O. T. .0^3 53 doses, 420 days
22 F., 25	A D	Mod. Adv. Improved	II II	R² R²	16 months 25 months	Favorable Favorable	Unimpaired Unimpaired	99 105	125		99 98.2	O			Fever Pregnancy	O T. .0002 47 doses, 270 days
23 M., 18	A D	Probable Probable	I	R	4 months 7 months	Favorable Favorable	Unimpaired Unimpaired	135 135	138		98.7 Bel. 99			O	O	O T. .0004 22 doses, 80 days

TABLE I.—Continued.

No. Sex Age	Condition		Extent of Physical Signs (Turban) Both Lungs	Extent of Physical Signs (Turban) Each Lung	Duration of Disease	General Condition	Digestion	Weight Actual	Weight Standard	Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B.	T. B. Previous	T. B. Residence	Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
24 M., 51	A D	Far Adv. Progress.	III III	R^1 L^2 R^2 L^3	5 months 25 months	Unfavorable Unfavorable	Unimpaired Unimpaired	121 131	143	67- 90	100.9 101	+ +		+	O	O. T. .000009 T. R. .000001 H. B. F. .0000003 105 doses, 560 days
25 M., 25	A D	Mod. Adv. Progress.	II III	R^2 L^1 R^3 L^1	18 months 30 months	Favorable Favorable	Unimpaired Unimpaired	162 158	154	60- 75 64- 68	98.2 98.2		+		O	O. T. .030 T. R. .000001 68 dosos, 345 days
26 M., 39	A D	Mod. Adv. Improved	II II	R^1 L^1 R^1 L^1	6½ months 17 months	Favorable Favorable	Unimpaired Unimpaired	138 150	150	72- 90 78- 83	98.4 98.3			O	Pleurisy with Effusion	O. T. .0008 T. R. .000001 72 doses, 340 days
27 M., 34	A D	Far Adv. Arrested	III III	R^2 L^3 R^2 L^2	3 months 11 months	Favorable Favorable	Unimpaired Unimpaired	107 118		84- 86	99 98.7	+ +		+	O	O.T. .03 T.R. .000001 H. B. F. .00006 } 121 doses 250 days
28 F., 40	A D	Far Adv. Progress.	III III	R^2 L^2 R^2 L^2	37 months 53 months	Favorable Unfavorable	Unimpaired Impaired	123 113			99.1 100.2	+		+	O	O. T. .0002 H. B. F. .00000002 61 doses, 270 days
29 F., 23	A D	Mod. Adv. Improved	III III	R^1 L^3 R^1 L^3	2 months 9 months	Favorable Favorable	Unimpaired Unimpaired	131 140	135		98.4 98.4				Pregnancy	O. T. .0002 27 doses, 128 days
30 F., 31	A D	Far Adv. Progress.	III III	R^3 L^1 R^3 L^1	9 months 14 months	Unfavorable Unfavorable	Impaired Impaired	109 108			98.7 98.6	+		+	Tuberculous Laryngitis	O. T. .000008 36 doses, 154 days
31 M., 20	A D	Mod. Adv. Arrested	II II	R^2 L^1 R^2 L^1	2 months 8 months	Favorable Favorable	Unimpaired Unimpaired	130 148	135	80- 90	97.5 Bel. 99	+ +		O	O	O. T. .0003 T. R. .000001 37 doses, 190 days
32 F., 16	A D	Ineipient Ap. Cured	I I	R L R L	54 months 69 months	Favorable Favorable	Unimpaired Unimpaired	97 105		80- 90	99.3 98.3		O	+	O	O. T. .0008 B. B. F. .000004 69 doses, 450 days
33 F., 24	A D	Far Adv. Progress.	III III	R^1 L^2 R^2 L^3	9 months 27 months	Unfavorable Unfavorable	Impaired Impaired	108 110	105	90- 98	99 100.4	+		+	....	O. T. .000008 H. B. F. .0000005 93 doses, 530 days
34 F., 26	A D	Probable Probable	I I	R L R L	72 months 80 months	Favorable Favorable	Unimpaired Unimpaired	90 102		66- 86 76- 82	99.1 99.1	O			Tonsillitis Pelvic Disorder	O. T. .00003 24 doses, 165 days
35 F., 26	A D	Ineipient Arrested	I I	R L R L	11 months 16 months	Favorable Favorable	Unimpaired Unimpaired	155 174	176	68- 80 78- 90	98.9 99.1	+			O	O. T. .00035 30 doses, 156 days
36 F., 25	A D	Probable Cured	I	R	11 months 24 months	Favorable Favorable	Unimpaired Unimpaired	151 144	140	64- 82 72- 78	98.5 98.4	O		O	O	O. T. .012 79 doses, 387 days
37 F., 20	A D	Ineipient Ap. Cured	I	R L	13 months 29 months	Favorable Favorable	Unimpaired Unimpaired	106 104	110	76-100 86- 84	98.4 98.5	O		+	Hemorrhoids	O. T. .00009 H. B. F. .015 96 doses, 462 days
38 M., 24	A D	Far Adv. Progress.	III III	R^2 L^3 R^3 L^3c	Several Yrs. Several Yrs.	Unfavorable Unfavorable	Impaired Impaired	124 110	145		100.5 100.7				Aortic Insufficiency	O. T. .000005 23 doses, 245 days
39 F., 20	A D	Probable Probable	I I	R R	3 months 12 months	Favorable Favorable	Unimpaired Unimpaired	114 121	118		98.6 Bel. 99	O		O	Old Tuberculous Arthritis	O. T. .045 59 doses, 275 days
40 F., 22	A D	Far Adv. Died	III III	R^2 L^3 R^2 L^3c	28 months 33 months	Unfavorable Unfavorable	Unimpaired Unimpaired	109 100	128	84- 98	98.4 99		+		O	O. T. .000001 26 doses, 140 days
41 F., 26	A D	Far Adv. Progress.	III III	R^3 L R^3 L^2	60 months 65 months	Favorable Unfavorable	Unimpaired Unimpaired	122 119	123		98.5 98.4				Tuberculous Laryngitis	O. T. .00004 33 doses, 145 days
42 M., 20	A D	Probable Probable	I I	R L R L	2 months 6 months	Favorable Favorable	Unimpaired Unimpaired	118 124	132	80- 82 68- 74	98.6 98.3	O		O	O	O. T. .00001 28 doses, 135 days
43 F., 47	A D	Ineipient Ap. Cured	I	R L	7 months 21 months	Favorable Favorable	Unimpaired Unimpaired	127 126		80-100 80- 88	98.8 97.8			O	O	O. T. .3 77 doses, 420 days
44 F., 19	A D	Far Adv. Arrested	III III	R^3 L^2 R^3 L^2	5 months 19 months	Unfavorable Favorable	Unimpaired Unimpaired	107 116		80- 90	98.7 99	+			O	O. T. .002 90 doses, 422 days
45 M., 40	A D	Mod. Adv. Arrested	II I	R^1 L^1 R^1 L^1	13 months 20 months	Favorable Favorable	Impaired Unimpaired	109 113		70- 84	98.8 98.1			+	Tinea Versicolor	O. T. .0005 43 doses, 221 days
46 F., 16	A D	Mod. Adv. Improved	II II	R^2 L R^2	5 months 18 months	Favorable Favorable	Impaired Unimpaired	91 108	95		98.2 98.6			+	Hemoptysis	O. T. 1.0 85 doses, 390 days
47 M., 22	A D	Far Adv. Arrested	III III	R^3 L^1 R^3 L^1	5 months 19 months	Unfavorable Favorable	Unimpaired Unimpaired	125 129	135	88- 94 78- 90	99 98.9			+	O	O. T. .012 97 doses, 515 days

TABLE I.—Concluded.

No. Sex Age		Condition	Extent of Physical Signs (Turban) Both Lungs	Extent of Physical Signs (Turban) Each Lung	Duration of Disease	General Condition	Digestion	Weight Actual	Weight Standard	Range of Pulse 7 days on Admission 2 days on Discharge	Av. Max. Temp. 7 days on Admission 2 days on Discharge	T. B.	T. B. Previous	T. B. Residence	Complications	Tuberculin Variety, No. of Days and Doses Highest Dose in Grams
48 F., 29	A	Far Adv.	III	R^3 L^2	6 months	Favorable	Unimpaired	122	125	92-108	98.4			+	O	O. T. .001
	D	Arrested	III	R^3 L^2	18 months	Favorable	Unimpaired	135		86- 88	99				.....	86 doses, 360 days
49 M., 25	A	Far Adv.	III	R^2 L^2	24 months	Favorable	Unimpaired	123	127		99.1				O	O. T. .0000001
	D	Progress.	III	R^2 L^2	27 months	Favorable	Unimpaired	125		76- 94	98.4				.....	18 doses, 101 days
50 M., 36	A	Probable	I	R L	15 months	Favorable	Unimpaired	144	159		98.2	O		O	O	O. T. .007
	D	Probable	I	R L	29 months	Favorable	Uuimpaired	143			98.2				....	50 doses, 410 days
51 F., 23	A	Probable	I	R L	12 months	Favorable	Unimpaired	131		90-120	99.8			O	Conjunctivitis	O. T. .0000005
	D	Probable	I	R L	17 months	Unfavorable	Unimpaired	130			100				.....	H. B. F. .0000002 18 doses, 160 days
52 M., 22	A	Far Adv.	III	R^3 L^3	60 months	Unfavorable	Unimpaired	130	136	84- 99	99.4	+		+	O	O. T. .00000003 33 doses
	D	Progress.	III	R^3 L^3	68 months	Unfavorable	Unimpaired	130		78-100	99.5	+			....	H. B. F. .0000005 239 days
53 F., 18	A	Incipient	I	R L	2 months	Favorable	Unimpaired	142	146		97.8	O			O	O. T. .1
	D	Ap. Cured			12 months	Favorable	Unimpaired	154		68- 80	98.1				.....	63 doses, 305 days
54 M., 27	A	Far Adv.	III	R^2 L^3c	8 months	Unfavorable	Unimpaired	144	155	76-104	102.2	+		+	O	O. T. .000005
	D	Progress.	III	R^2 L^3c	19 months	Unfavorable	Unimpaired	147			100.0				.....	H. B. F. .0000004 51 doses, 345 days
55 M., 18	A	Probable	I	R L	7 months	Favorable	Unimpaired	131	132	76- 96	98.6	O		O	Epilepsy	O. T. .0000008
	D	Probable	I	R	20 months	Favorable	Unimpaired	139			99.4				.....	H. B. F. .002 76 doses, 365 days
56 M., 36	A	Probable	I	R L	15 months	Favorable	Unimpaired	123			99.1			O	O	O. T. .15
	D	Probable			27 months	Favorable	Unimpaired	130			Bel. 99				....	67 doses, 355 days
57 M., 24	A	Probable	I	R	60 months	Favorable	Unimpaired	145	162	80-116	98.3	O		O	O	H. B. F. .0000005
	D	Probable	I	R	67 months	Favorable	Unimpaired	144			99				.....	O. T. .0000005 27 doses, 190 days
58 M., 20	A	Mod. Adv.	III	R^3 L	½ month	Favorable	Unimpaired	144		64- 88	98.1			O	Herpes Zoster	O. T. .003
	D	Improved	I	R L	9½ months	Favorable	Unimpaired	162		70- 90	97.9				.....	54 doses, 270 days
59 F., 15	A	Incipient	I	R L	36 months	Favorable	Unimpaired	122			98.7	O		O	O	O. T. .0003
	D	Ap. Cured			40 months	Favorable	Unimpaired	125			Bel. 99				.....	43 doses, 105 days
60 M., 31	A	Mod. Adv.	II	R^2 L	6 months	Favorable	Unimpaired	154	155		98.8	O		O	Hemoptysis	O. T. .000007
	D	Improved	II	R^2 L	17 months	Favorable	Unimpaired	175		84- 90	98.9				.....	H. B. F. .0003 76 doses. 340 days
61 M., 16	A	Far Adv.	II	R^2 L	3 months	Favorable	Unimpaired	122	122		98.9	+		O	Fever	O. T. .00000003
	D	Improved	II	R^2 L	13 months	Favorable	Unimpaired	133			99				.....	H. B. F. .03 59 doses, 310 days
62 F., 18	A	Probable	I	L	16 months	Favorable	Unimpaired	104	110	60- 90	98.8				O	O. T. .0000002
	D	Probable			26 months	Favorable	Unimpaired	106			98.6				.....	H. B. F. .0015 58 doses, 300 days
63 F., 20	A	Doubtful	I	R	12 months	Favorable	Unimpaired	102	122	64- 96	97.8	O			O	H. B. F. .00003
	D	Doubtful	I	R	19 months	Favorable	Unimpaired	103		89- 99	99.2				.....	47 doses, 210 days
64 F., 39	A	Mod. Adv.	I	R L	48 months	Favorable	Unimpaired	108	121	64- 100	98.9			O	Deltoid Bursitis	O. T. .0003
	D	Arrested	I	R L	56 months	Favorable	Unimpaired	120		86- 100	99.1				.....	57 doses, 240 days
65 M., 23	A	Far Adv.	III	R^2 L^2	4 months	Favorable	Unimpaired	128		62- 88	98.8	+		O	O	H. B. F. .0000007
	D	Arrested	II	R^2 L^2	13 months	Favorable	Unimpaired	135		70- 76	98.3				....	41 doses, 274 days
66 F., 24	A	Probable	II	R^2 L^1	7 months	Favorable	Impaired	106			98.7	O		O	Hyst. Aphonia	H. B. F. .00005
	D	Probable	II	R^2 L^1	14 months	Favorable	Impaired	113		75- 80	99				and Abd. Attacks	45 doses, 215 days
67 F., 18	A	Far Adv.	III	R^2 L^2	8 months	Unfavorable	Impaired	101	110	70-100	98.9	+			O	H. B. F. .0000007
	D	Progress.	III	R^2 L^2	12 months	Unfavorable	Impaired	93		90-112	99.4				.....	27 doses, 122 days
68 F., 28	A	Mod. Adv.	II	R^2 L	36 months	Favorable	Unimpaired	119	117	76- 94	99.3	O		O	O	H. B. F. .00008
	D	Arrested	II	R^2 L	43 months	Favorable	Unimpaired	140		72- 80	98.6				....	49 doses, 200 days
69 M., 20	A	Far Adv.	III	R^2 L^2	14 months	Unfavorable	Unimpaired	129	138		98.2	+	+		O	H. B. F. .000002
	D	Progress.	III	R^2 L^2	20 months	Unfavorable	Unimpaired	129			98.8				.....	40 doses, 190 days
70 F., 18	A	Far Adv.	II	R^1 L^2	9 months	Favorable	Unimpaired	166	185	90-120	99		+		Pleurisy with	H. B. F. .000003
	D	Progress.	II	R^1 L^2	13 months	Favorable	Unimpaired	169		79-115	98.6				Effusion	16 doses, 115 days
71 M., 18	A	Far Adv.	II	R^2 L	4 months	Favorable	Unimpaired	130	122		98.7		+	+	O	H. B. F. .0002
	D	Arrested	II	R^2 L	10 months	Favorable	Unimpaired	139		68- 73	98.5				.....	34 doses, 182 days

TABLE II.

Summary of Results of Treatment.

Class	Extent of Physical Signs According to Turban	T. B. Found at Any Time	Hygienic-dietetic Treatment With Tuberculin. Patients Who Took Tuberculin More Than 90 Days. Average Residence, 292 Days					
			Cases	Appar. Cured	Arrested	Improved	Progressive	Died
Incipient	I	O	9=16%	6=67%	1= 11%	1= 11%	1= 11%	.....
"	I	+	4= 7%	2=50%	1= 25%	1= 25%	.....	.....
Moderately Advanced	I	O	1= 2%	.....	1=100%	.....	.....	.....
" "	II	O	7=12%	1=14%	2= 29%	4= 57%	.....	.....
" "	II	+	6=11%	1=17%	2= 33%	1= 17%	2= 33%	.....
" "	III	O	2= 4%	.....	.....	2=100%	.....	.....
Far Advanced	II	+	4= 7%	.....	1= 25%	1= 25%	2= 50%	.....
" "	III	+	21=37%	.....	8= 38%	2= 10%	10= 48%	1= 5%
" "	III	O	3= 5%	.....	.....	.....	3=100%	.....

TABLE III.—AVERAGE GAIN IN WEIGHT.

Probable	3½ lbs.	5½ lbs.	..Apparently cured.
Incipient	6½ "	12 "	.....Arrested.
Moderately advanced.	10 "	12 "	.....Improved.
Far advanced	6 "	⅕ "	.....Progressive.

TABLE IV.—AVERAGE MAXIMUM DOSE OF TUBERCULIN.

	Grams.	Grams.	Cases.
Probable	0.048	0.066 Apparently cured....	10
Incipient	0.128	0.101 Arrested	16
Moderately advanced....	0.075	0.101 Improved	12
Far advanced	0.028	0.010 Progressive	18

Compiled from Dr. Brown's Series in 24th Annual Report from Adirondack Cottage Sanitarium:

	Grams.	Grams.	Cases.
		0.002 Apparently cured....	12
Incipient	0.078	0.147 Arrested	57
Moderately advanced....	0.089	0.002 Improved	22
		0.001 Progressive	9

TABLE V.—AVERAGE NUMBER OF DAYS AND DOSES TO REACH MAXIMUM DOSE.

	Doses.	Days.	Days.	Doses.	
Probable	36	191	256	50	...Apparently cured.
Incipient	46	229	216	49	.....Arrested.
Moderately advanced.	46	216	206	48	.....Improved.
Far advanced	33	144	97	23	.....Progressive.

TABLE VI.—AVERAGE TOTAL NUMBER OF DAYS OF TREATMENT AND OF DOSES.

	Doses.	Days.	Days.	Doses.	
Probable	47	264	325	64	...Apparently cured.
Incipient	59	316	314	64	.....Arrested.
Moderately advanced.	54	280	318	61	.....Improved.
Far advanced	59	292	246	46	.....Progressive.

TABLE VII.—AVERAGE NUMBER OF DAYS BETWEEN SUCCESSIVE DOSES.

Probable	5.5	5.1	.....Apparently cured.
Incipient	5.4	4.9	.....Arrested.
Moderately advanced.....	5.1	5.1	.....Improved.
Far advanced	4.9	5.3	.....Progressive.

TABLE VIII.—AVERAGE NUMBER OF REACTIONS.

Probable	.3	.4	.....Apparently cured.
Incipient	.46	1.4	.....Arrested.
Moderately advanced	.6	1.1	.....Improved.
Far advanced	1.5	.9	.....Progressive.

TABLE IX.—AVERAGE NUMBER OF DAYS AND DOSES INTERVENING BETWEEN REACTIONS.

	Doses.	Days.	Days.	Doses.	
Probable	160	880	812	160	..Apparently cured.
Incipient	128	687	224	46	.....Arrested.
Moderately advanced.	92	466	289	56	.....Improved.
Far advanced	40	195	273	51	.....Progressive.

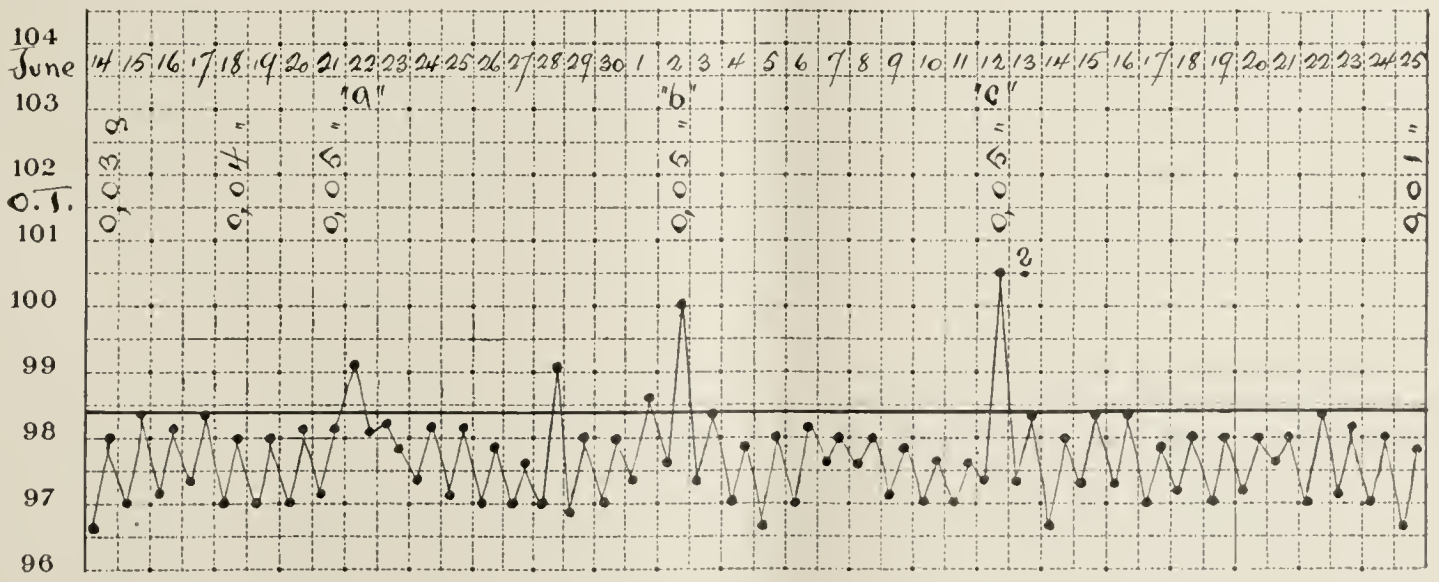


CHART No. 1. CASE No. 1077.—At *a* there is a typical reaction to 0,05 gm. followed by a still more severe reaction to the same dose at *b* and *c*. At *c* the patient felt too ill to take his temperature but is confident that it was much higher than during the two preceding reactions. During these reactions there was no increase in the physical signs and patient's general condition did not suffer.

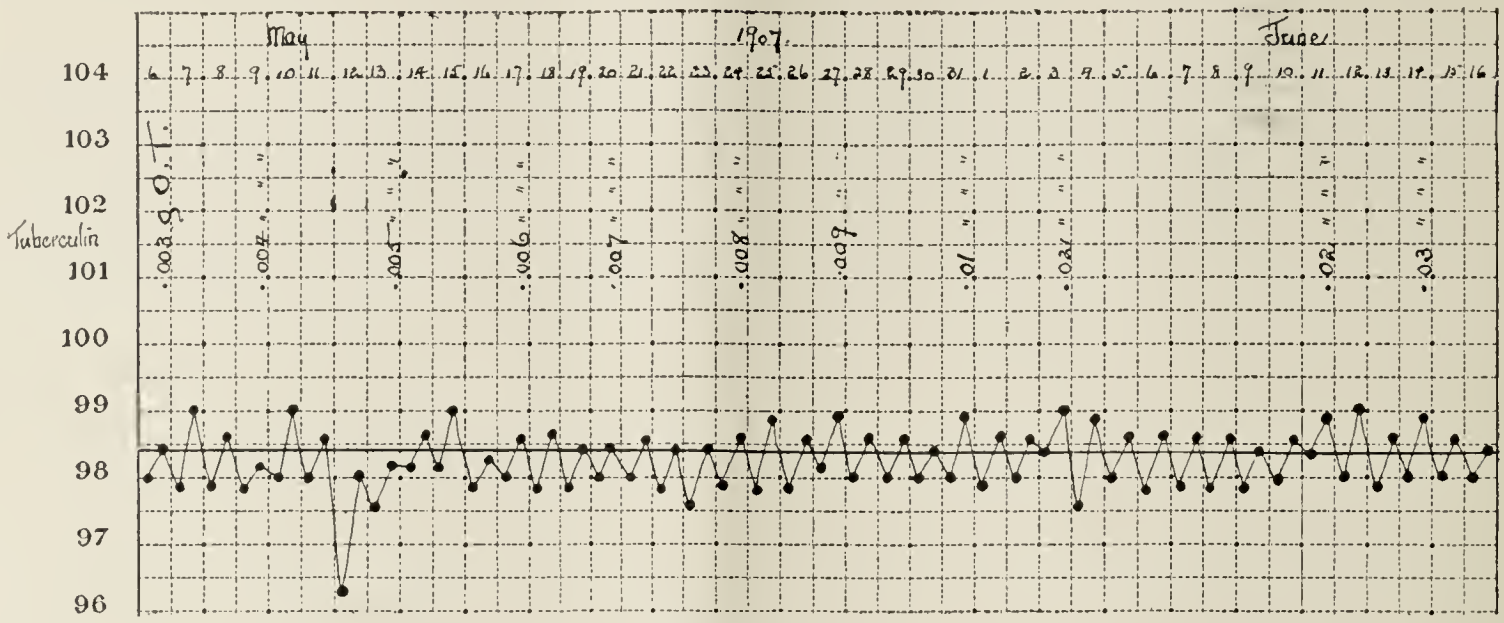


Chart No. 2a.

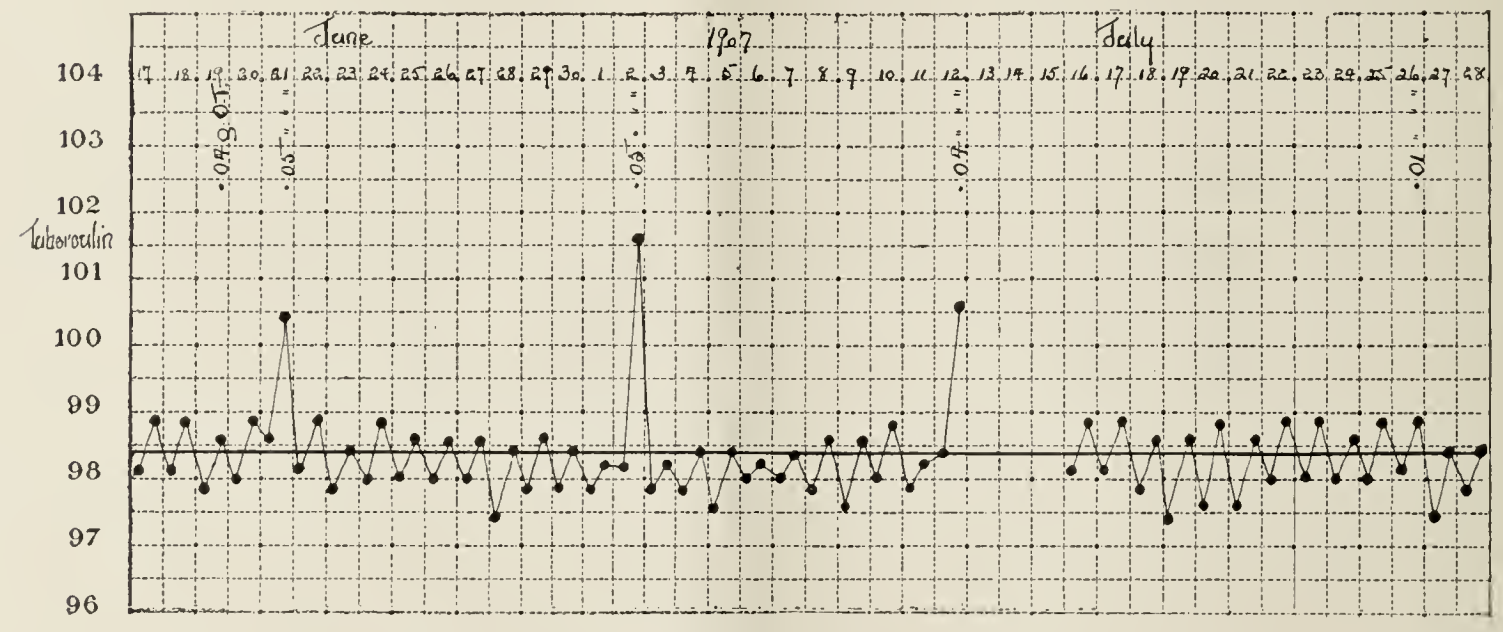


Chart No. 2b.

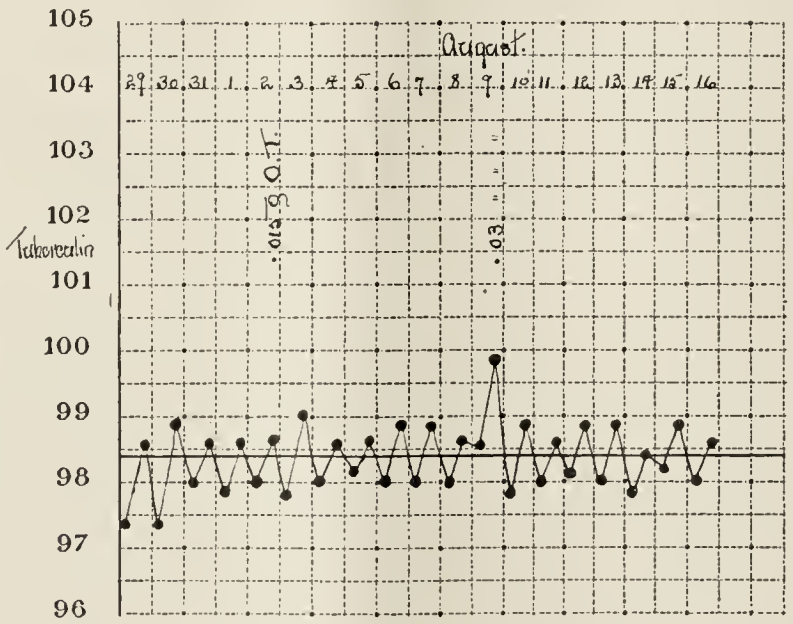


Chart No. 2c.

CHART No. 2. CASE No. 1290.—On May 7 and 9 there is a slight febrile reaction with local pain and swelling. On the 15th following 0,005 gm. there is another slight reaction. On the 21st cough is increased after 0,007 gm. On the 25th and the 27th and the 31st and the 3d of June there are slight febrile reactions and on June 3d he had headache and general malaise. There is another slight reaction on the 12th after 0,02 gm. although there were no constitutional symptoms. After 0,05 gm. there is a marked reaction followed by a still more severe reaction upon the repetition of this dose. There is a third reaction to 0,04 gm. and on August 9 a reaction to 0,03 gm. After the three severe reactions the physical signs spread in a remarkable manner. Râles had previously been heard only above and below the clavicle and to the second dorsal spine. They were then present over the whole front and to the angle of the scapula behind and are still present 18 months after treatment was stopped. Patient's general condition suffered too and it was some weeks before he regained his accustomed vigor.

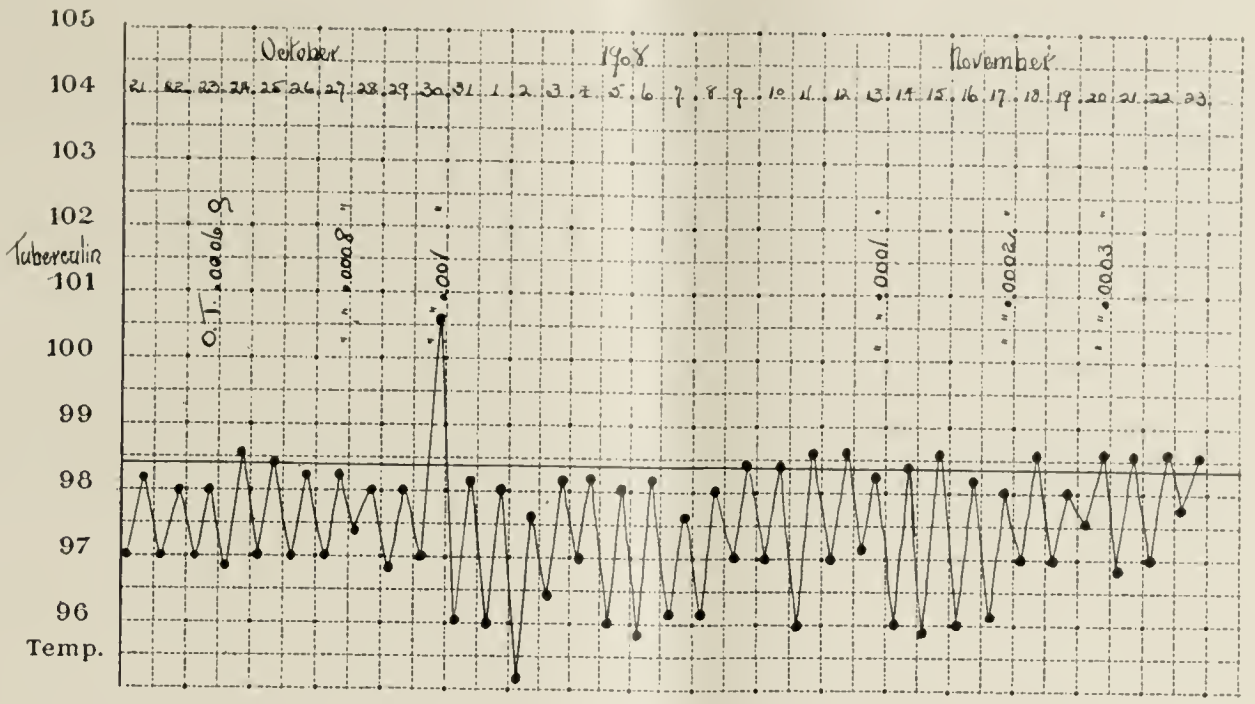


Chart No. 3. Case No. 2162.—On October 30 when 1 mg. was given it was noted that a large area of infiltration was still present from the previous injection although the patient made no complaint of it. The 1 mg. should not have been given. After decreasing the dose and then ascending the 1 mg. mark was gradually passed.

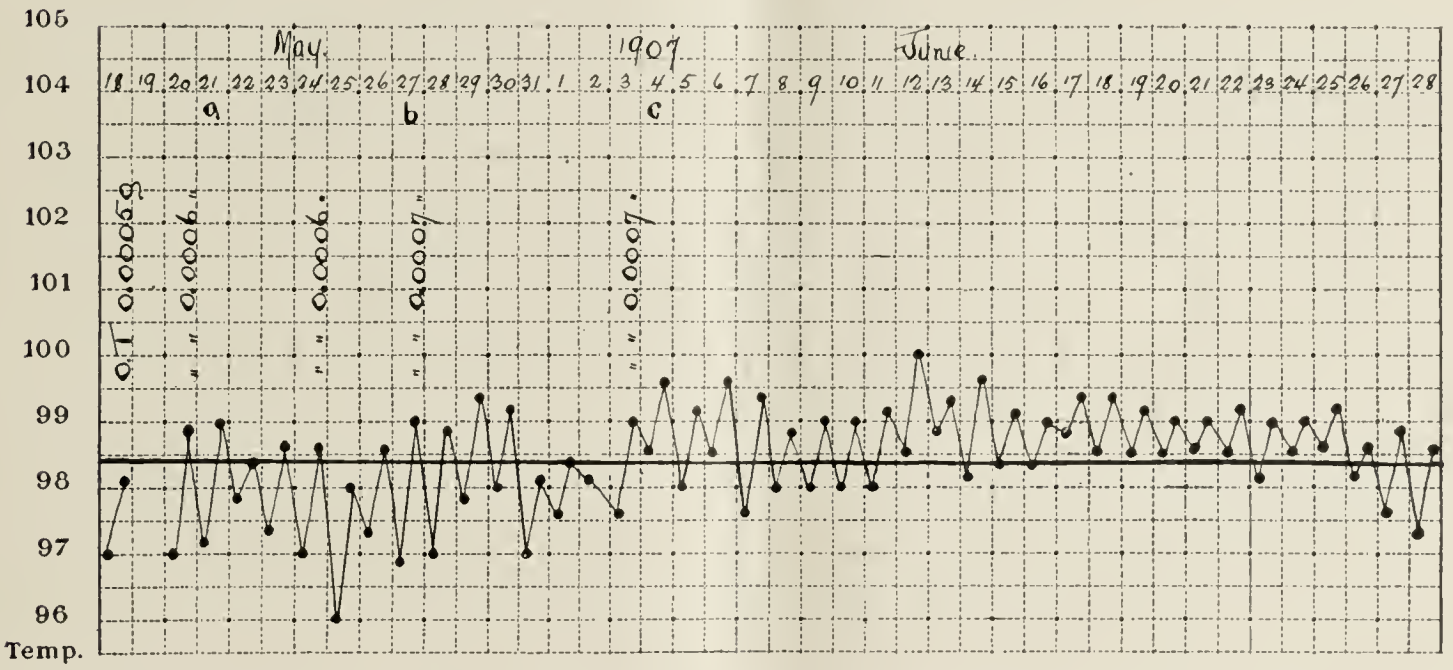


Chart No. 4. Case No. 1388.—At *a* there is a slight rise of temperature after 0,000,6 gm. When this dose is repeated there is no reaction. At *b* there is a definite elevation of temperature for three days following the injection and on May 31 no injection was given. At *c* after a repetition of the same dose a not severe but a prolonged reaction is induced, associated for the first few days with constitutional symptoms.

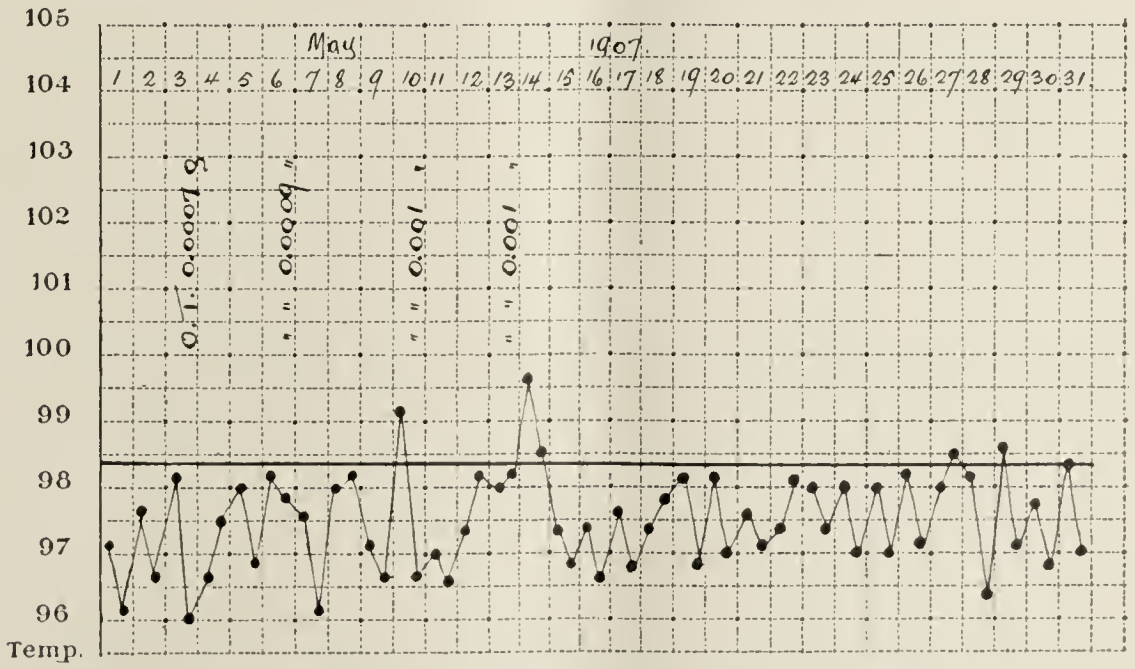


Chart No. 5. Case No. 1151.—On May 10 there is a mild reaction to 0,001 gm. and a more severe reaction on the 17th when the dose is repeated.

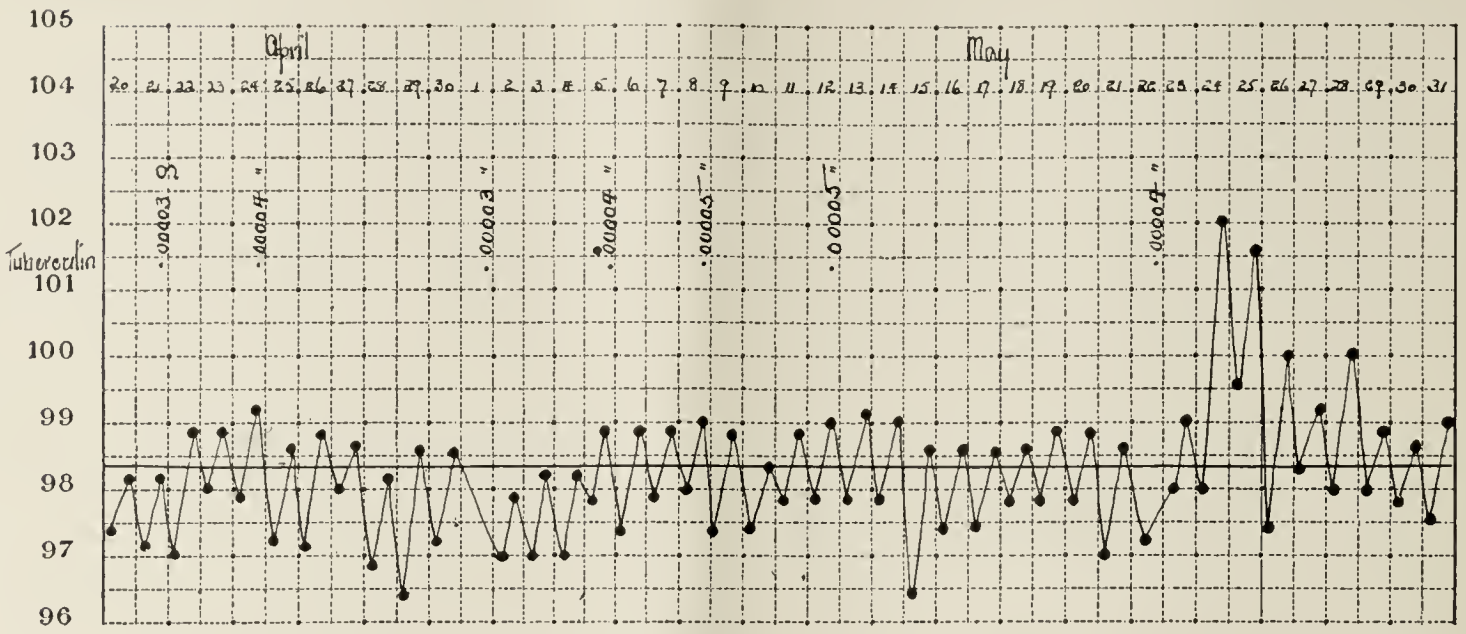


CHART No. 6. CASE No. 2162.—A reaction to 0,000,04 gm. after several previous slight reactions.

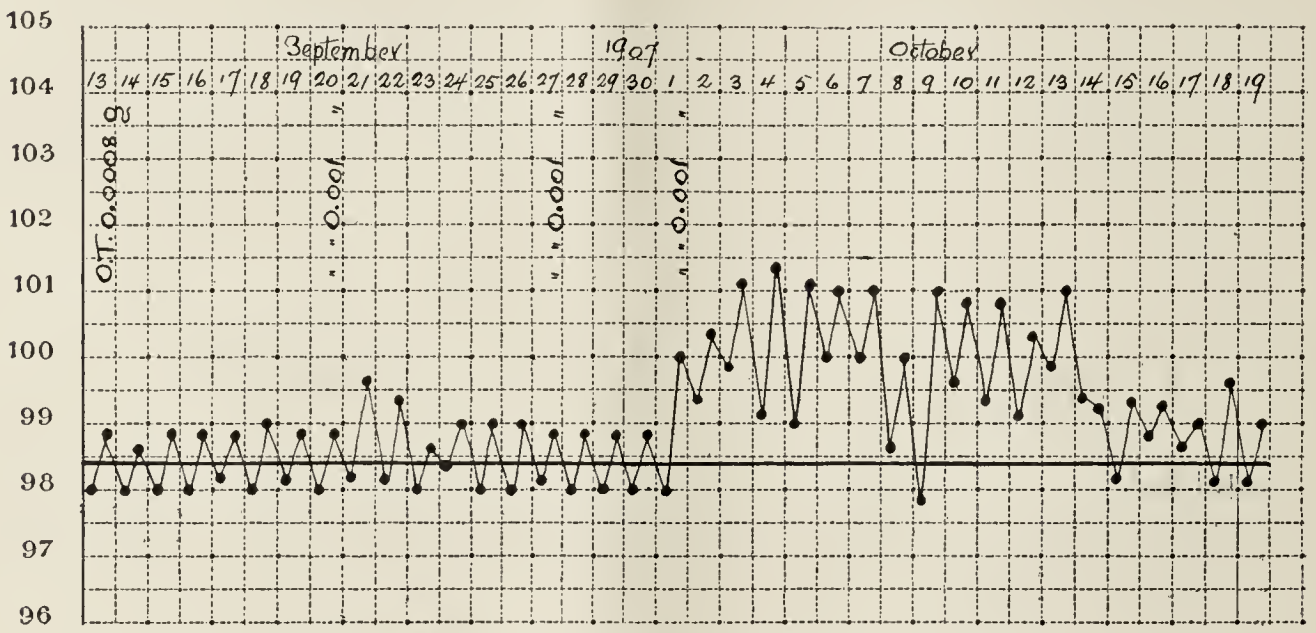


CHART No. 7. CASE No. 1542.—A prolonged reaction after the third dose of 0,001 gm. There had previously been a slight reaction after the same dose.

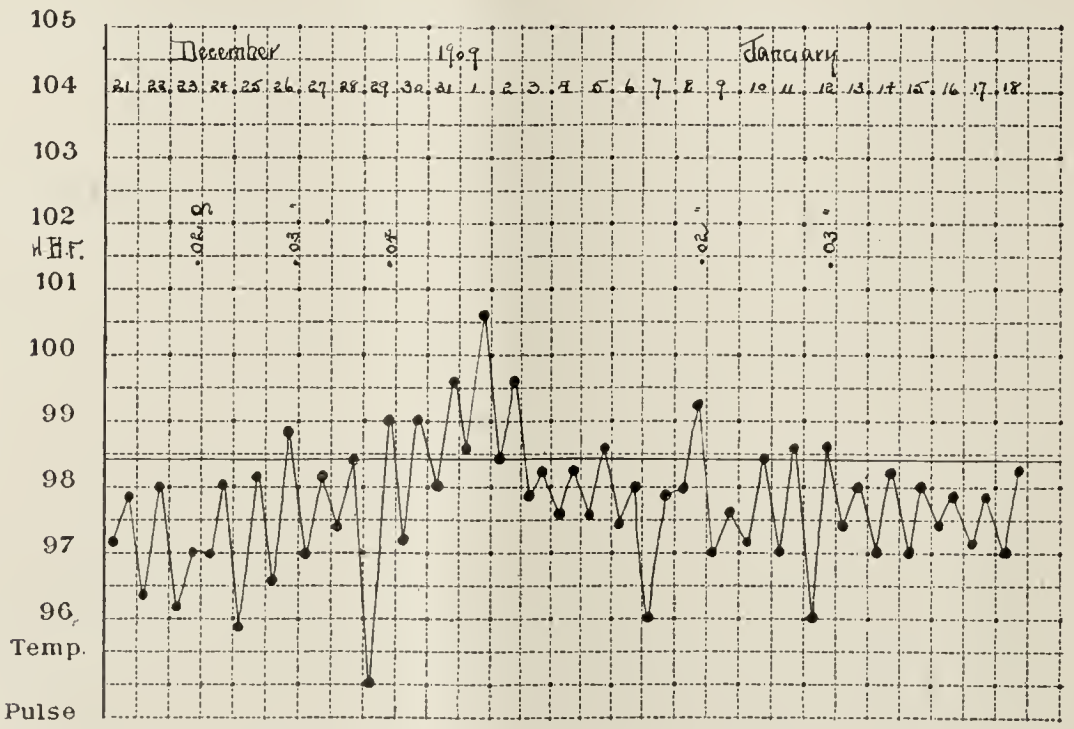


CHART No. 8. CASE No. 2089.—The reaction of January 1 was associated with tonsilitis and was not due to tuberculin injection.

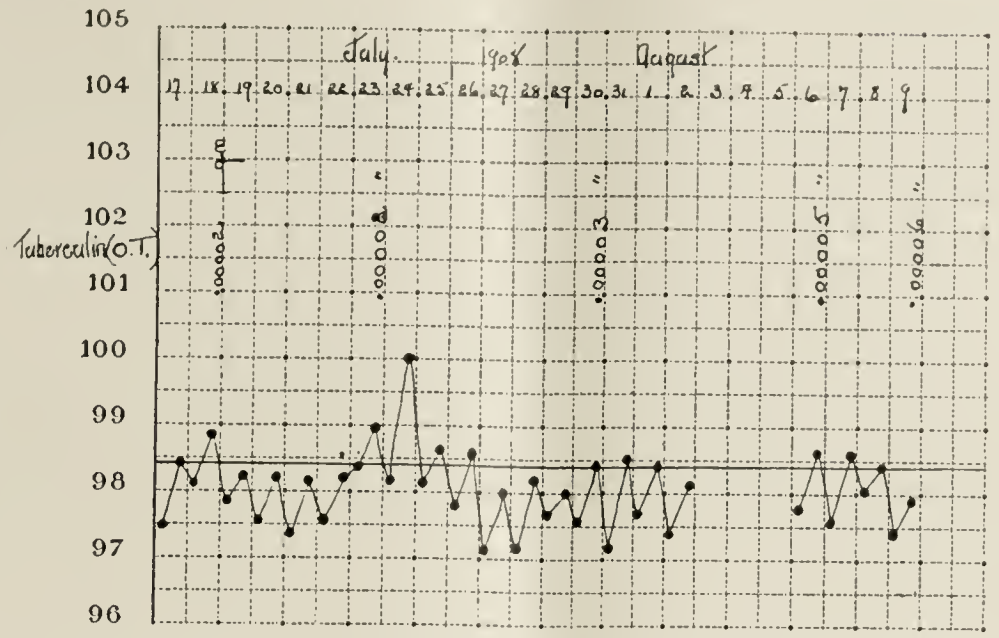


CHART No. 9. CASE No. 1532.—On July 24 there is a rise of temperature which has the appearance of a genuine tuberculin reaction. The patient too had general constitutional symptoms. However, on the same day he developed an attack of tonsilitis. The fact that there is no reaction when the same dose is repeated is a point against its being a tuberculin reaction.

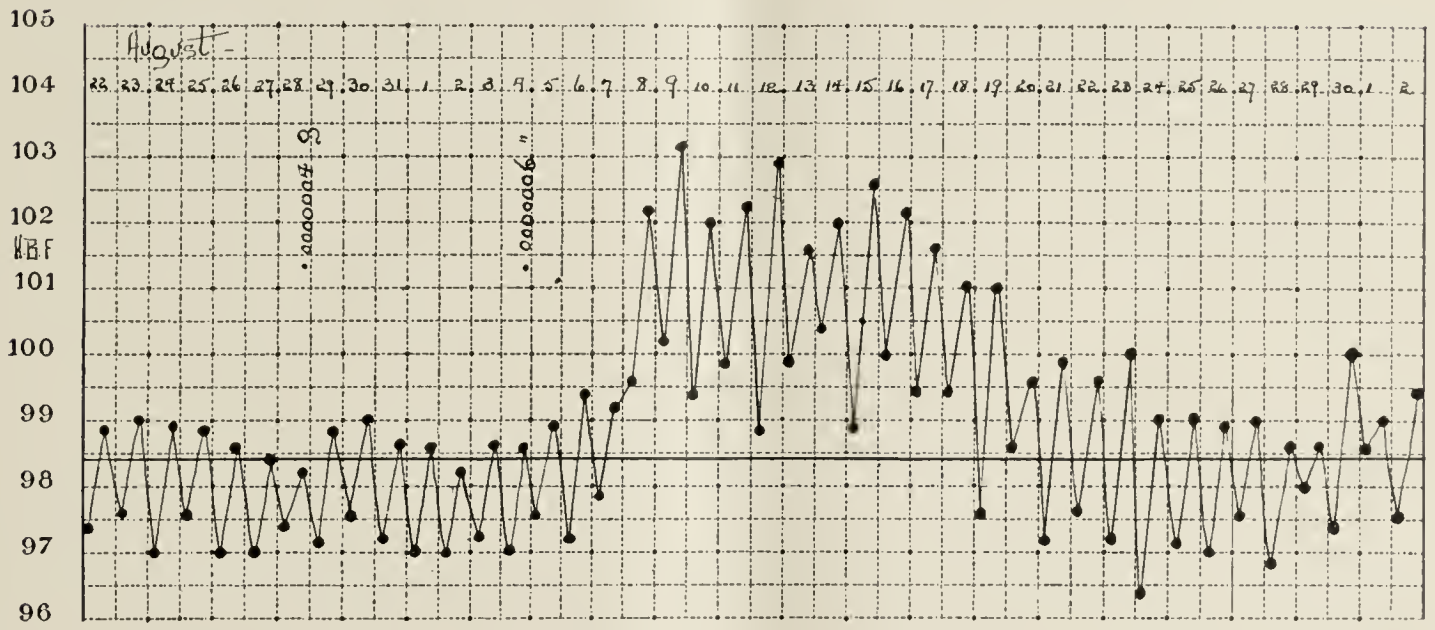


CHART No. 10. CASE No. 3011.—This febrile reaction is certainly quite independent of tuberculin. The temperature did not rise until four days after the injection and there were no local manifestations. The patient had symptoms of grippe.

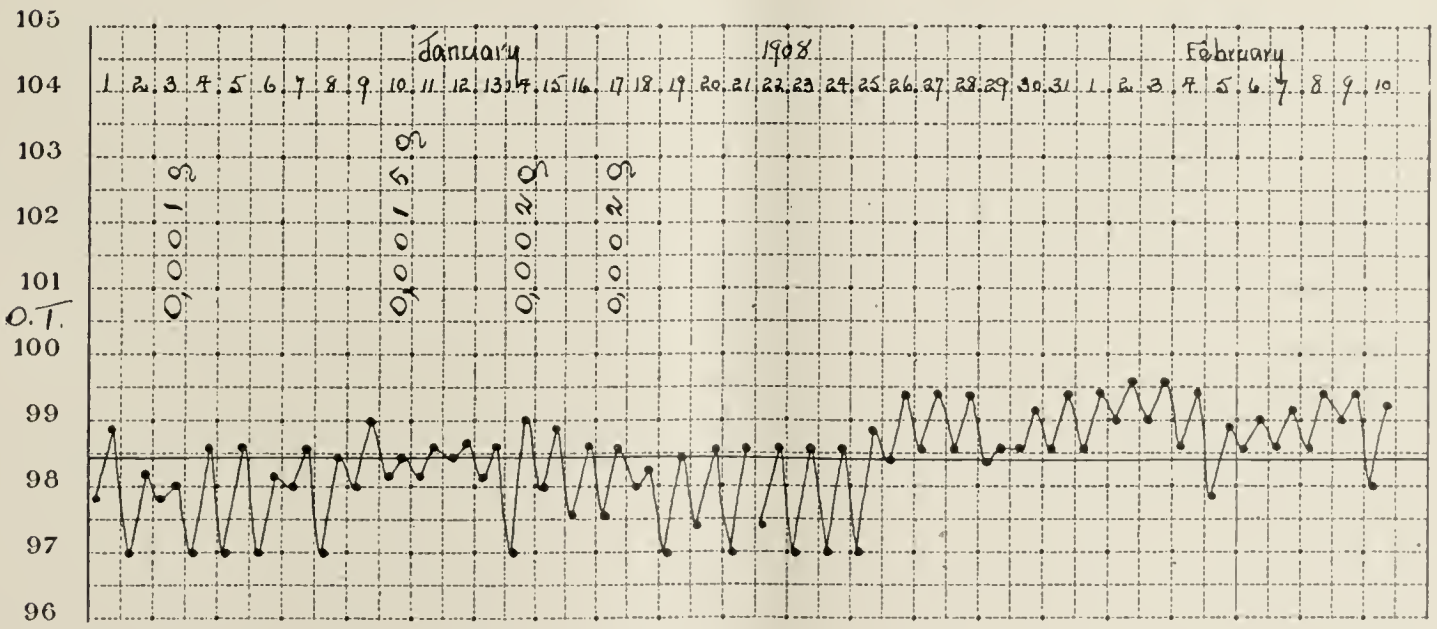


CHART No. 11. CASE No. 394.—Patient began to feel ill on January 21. Headache and pains over the body, and pain in bones. The rise of temperature marks the onset of secondary symptoms of lues.

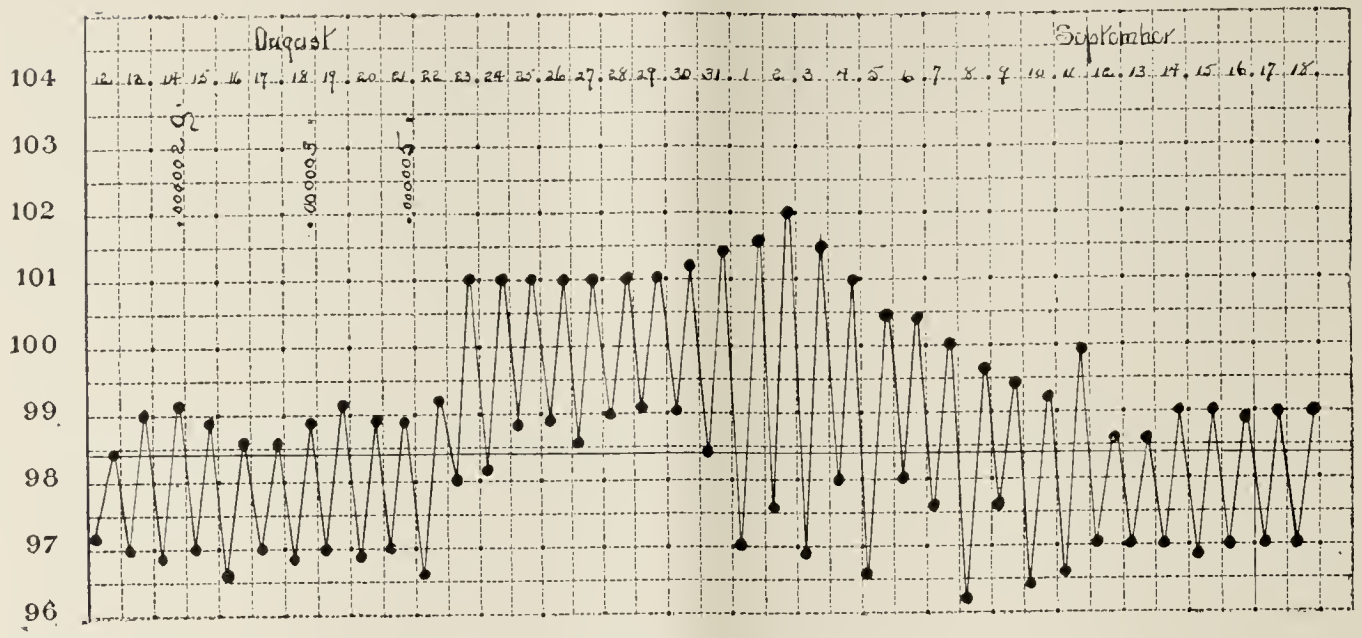


CHART No. 12. CASE No. 2316.—It is difficult to say if this febrile elevation has any relation to tuberculin. The patient did not have pain or swelling at the site of injection and had previously shown no signs of developing intolerance.

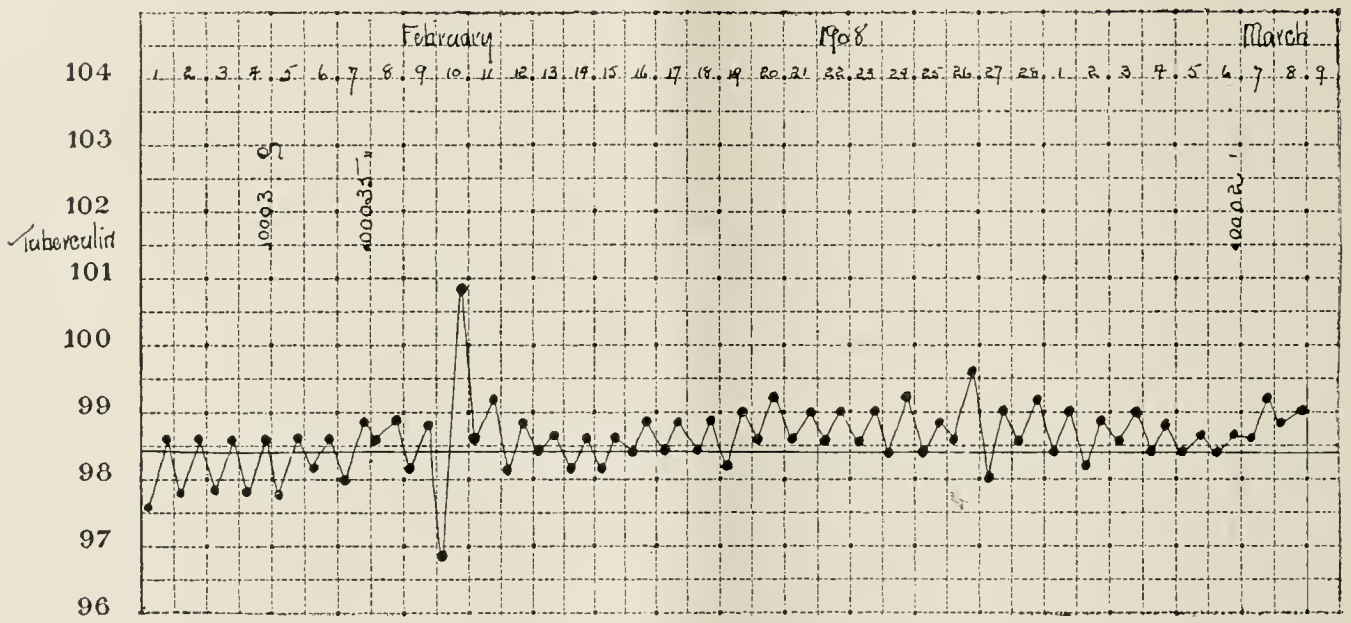


CHART No. 13. CASE No. 1967.—This chart is interesting because there is no special rise of fever until seventy-two hours after the injection. It might be questioned whether this was a genuine reaction. It was not preceded by premonitory symptoms. However, after the injection of March 6 there was a slight rise of temperature with marked pain and swelling at site of injection, showing that the sensitiveness to tuberculin had been greatly increased.

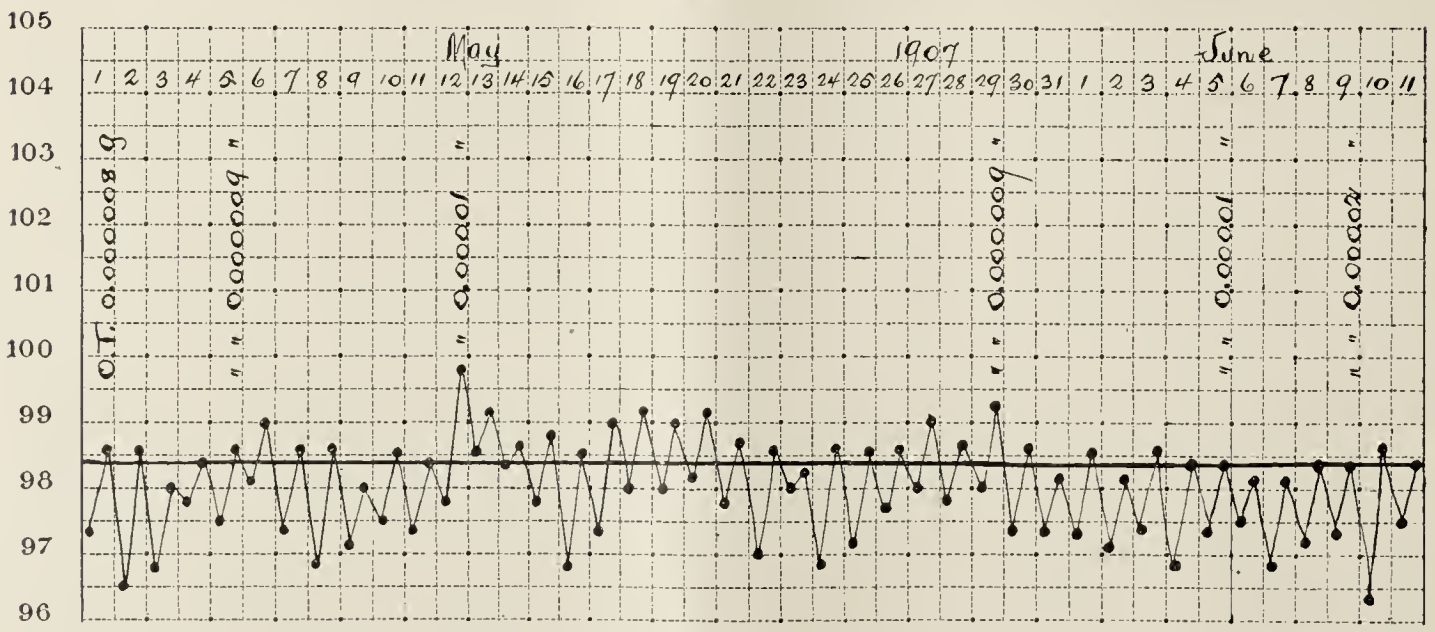


CHART No. 14. CASE No. 1217.—After the injection on May 5, patient had local pain and swelling. After omitting one dose he received a still higher dose followed by a prolonged reaction accompanied by marked constitutional symptoms for the first few days and a prolonged period of general malaise. On the 29th there is a slight reaction with constitutional symptoms to a smaller dose. No further reactions although the dose is steadily increased.

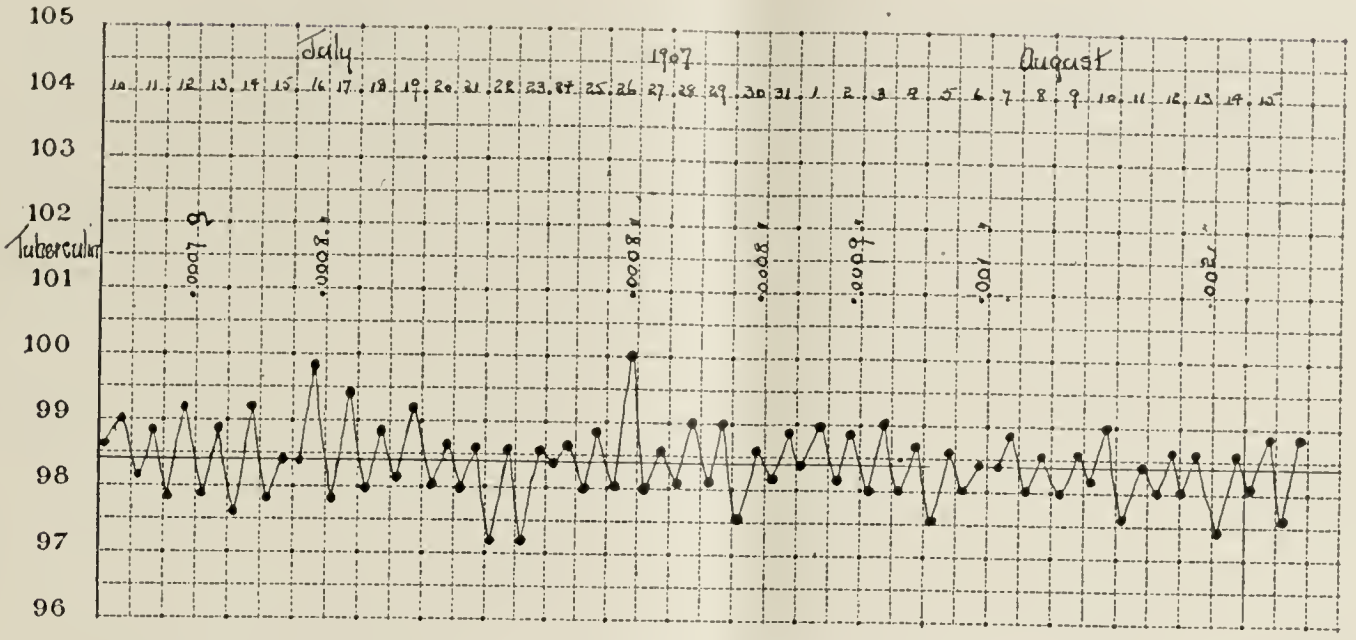


Chart No. 15. Case No. 830.—On July 16 there is a mild reaction and on the 26th another reaction when the same dose is repeated after a pause of 10 days. There are no further reactions although the dose is steadily increased.

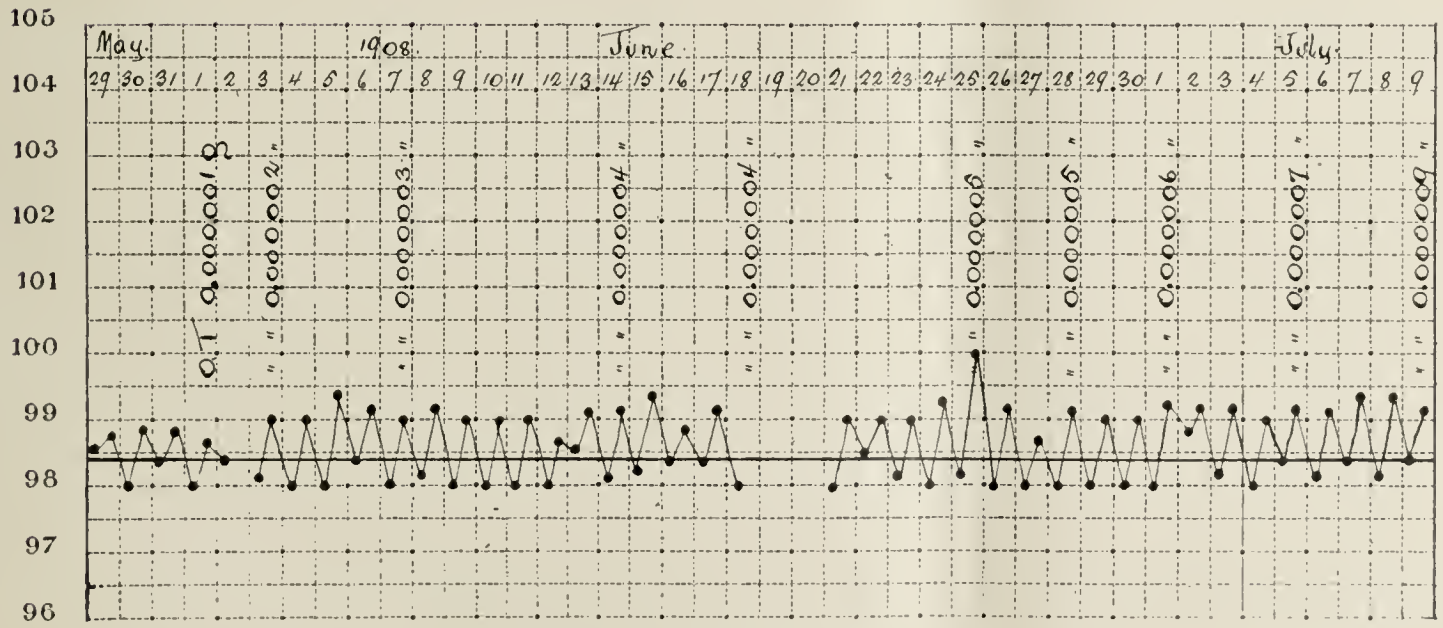


Chart No. 16a.

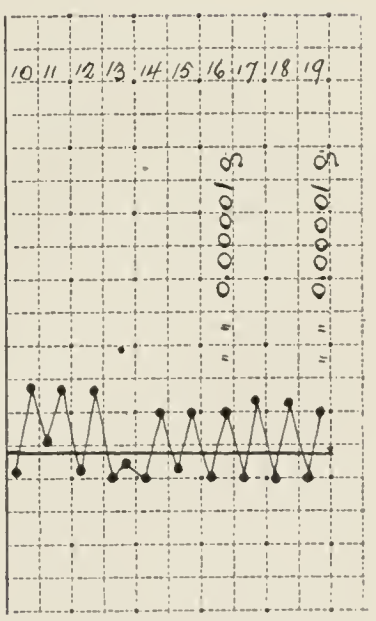


Chart No. 16b.

Chart No. 16. Case No. 1542.—This chart shows a number of slight reactions to small doses. The dose is gradually increased and tolerance acquired.

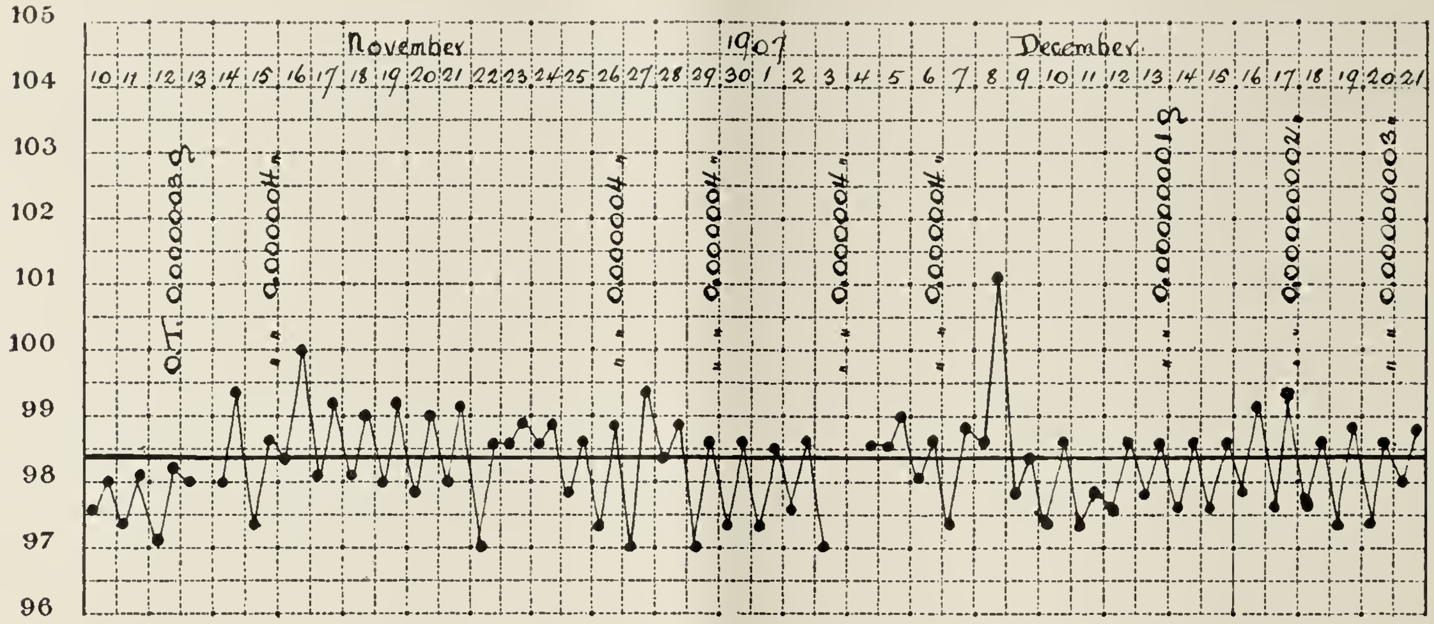


Chart No. 17. Case No. 1336.—This chart shows very well a number of slight reactions to 0,000,004 gm. O. T. with a severe reaction after the fifth dose. There had been local pain and swelling after several of the preceding doses.

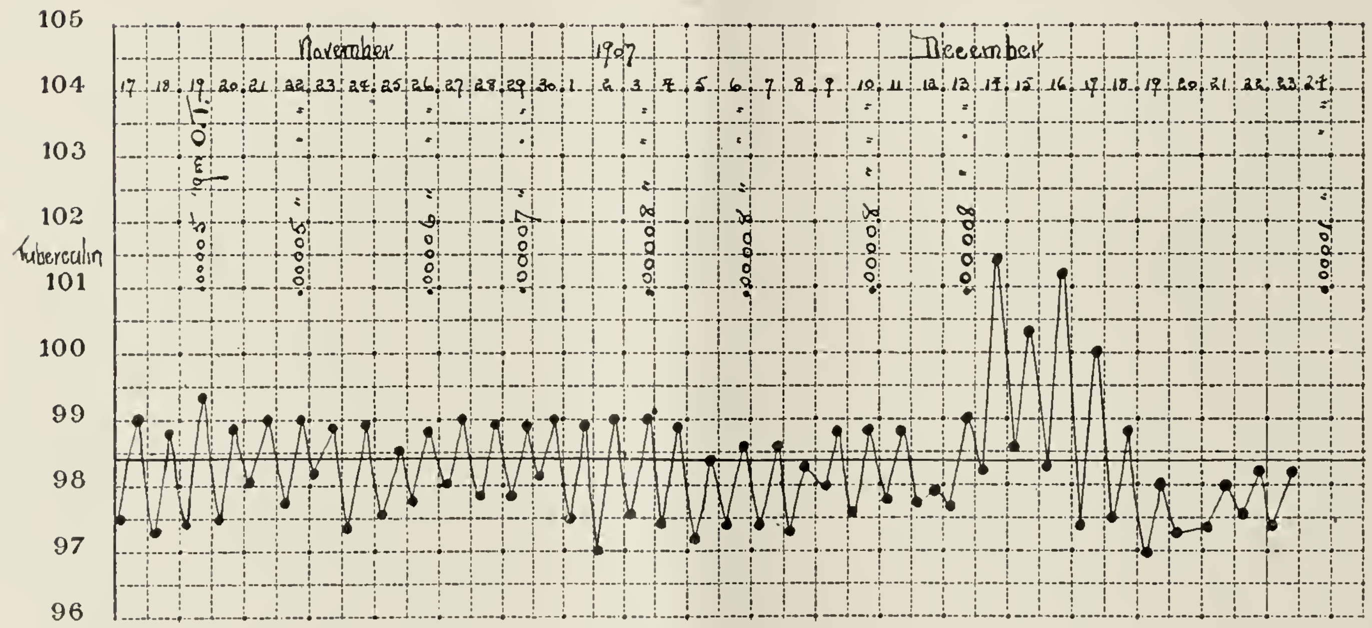


Chart No. 18. Case No. 1811.—On December 14 there is a characteristic reaction following the fourth dose of 0,000,08 gm. after sensitiveness to previous reactions had appeared at site of injections.

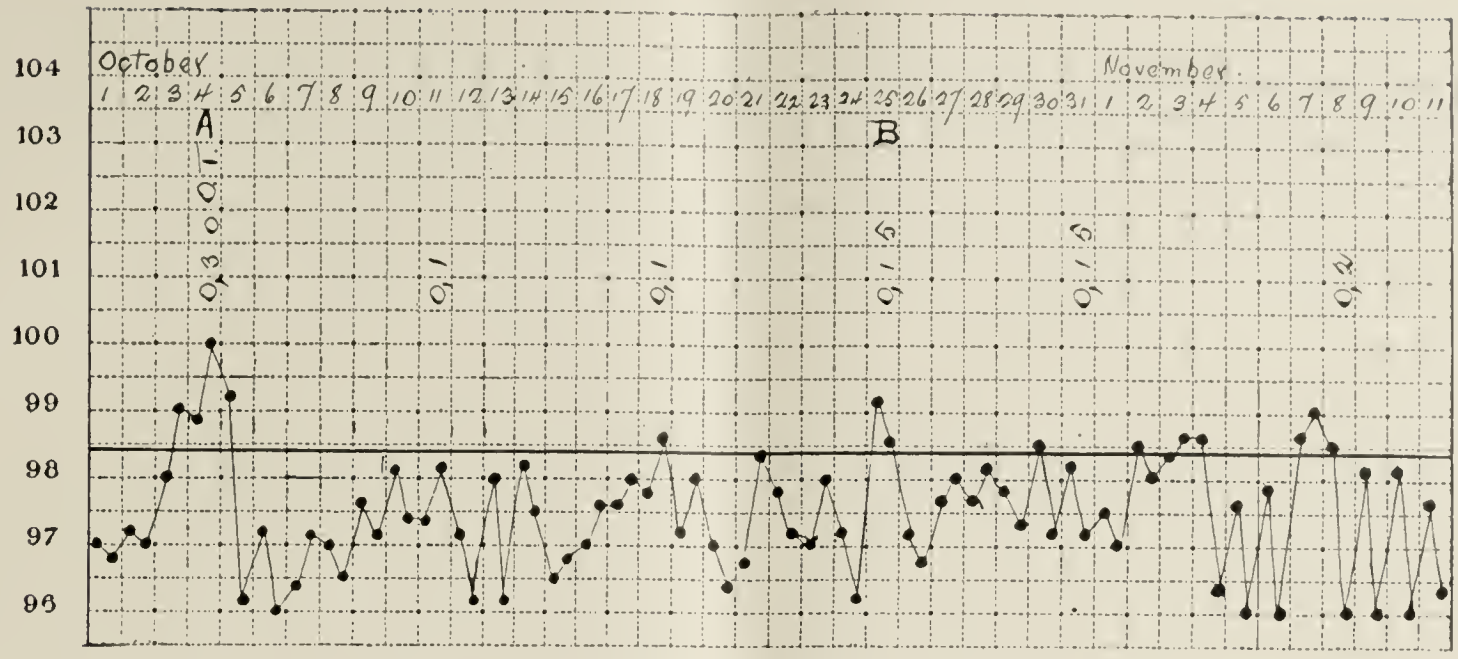


Chart No. 19a.

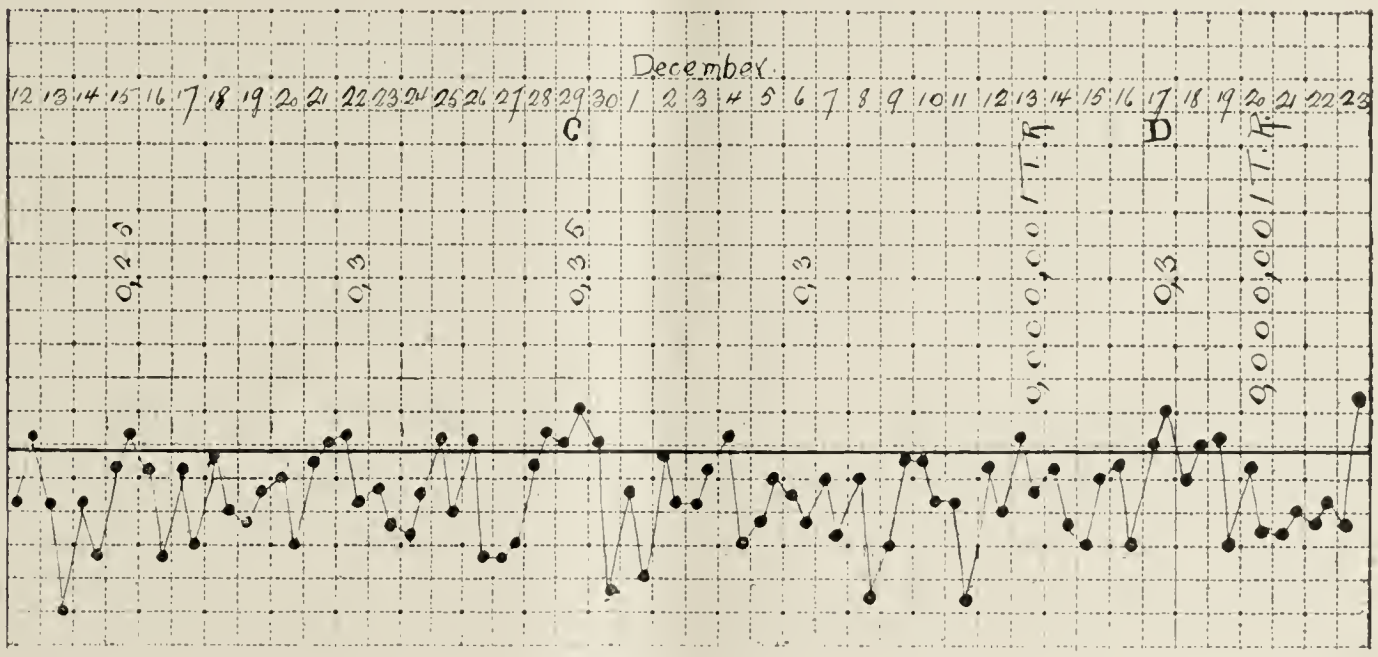


Chart No. 19b.

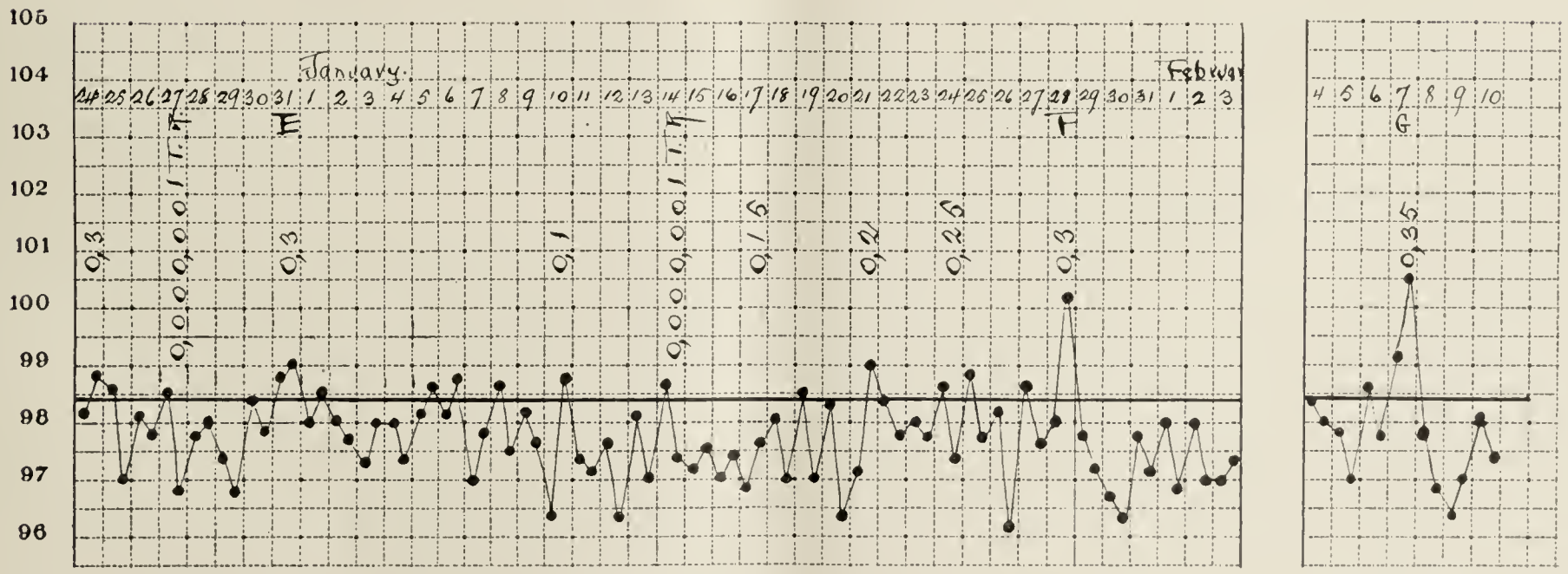


Chart No. 19c. Chart No. 19d.

Chart No. 19. Case No. 1151.—In this chart 0,3 gm. is approached three times, but is not passed successfully. At *A* there is a reaction to 0,3 gm. The dose is then reduced but at *B* there is a mild reaction to 0,15 gm. Upon the repetition of this dose there is no reaction. At *C* there is a mild reaction to 0,35 gm. and at *D* another reaction to 0,30 gm. Each reaction being accompanied by constitutional symptoms. At *E* and at *F* there are again definite reactions to 0,3 gm. and at *G* a reaction to 0,35 gm. These last reactions although the temperature was higher were accompanied by fewer constitutional symptoms than the preceding reactions.

A FURTHER REPORT OF THE WORK IN THE PHIPPS DISPENSARY FOR TUBERCULOSIS OF THE JOHNS HOPKINS HOSPITAL.

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Associate in Medicine, The Johns Hopkins University,

AND

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In the Johns Hopkins Hospital Bulletin for August, 1907, is a brief report of the first two years' work in the Phipps Dispensary for Tuberculosis. The report begins with the opening of the dispensary on March 1, 1905, but for some years, before the gift of Mr. Phipps made possible the erection of a special department for tuberculosis, efforts had been directed in the general medical clinic towards special study and supervision of the tuberculous cases. The origin and character of these efforts are not without interest, and as they have never been published they are briefly given here.

In 1898 the special study of tuberculosis was commenced by Prof. William Osler at the Johns Hopkins Hospital through funds provided by himself and interested friends, and Dr. Charles D. Parfitt was appointed to conduct the work and remained actively employed for one year.

In 1900, Dr. William Osler founded The Lænnec, a society for the study of tuberculosis, and stimulated special study of the tuberculous cases in the dispensary. Subsequently Blanche N. Epler, Adelaide Dutcher, and Elizabeth H. Blauvelt, all medical students, undertook the work during the two following years, visited the tuberculous poor of Baltimore and reported on their home conditions. Afterwards for a year or more all cases of pulmonary tuberculosis coming to the medical clinic were referred to Dr. Herman Bruelle, who gave them his special attention.

In 1903, Mr. Henry Phipps learned of the work of Dr. Osler, and through him became interested in the out-door tuberculosis work of the hospital, and his gift of ten thousand dollars ($10,000), subsequently increased to thirty-one thousand two hundred and fifty dollars ($31,250), made it possible to erect and equip a building, and constitute an entirely distinct clinic for tuberculous patients. The building was formally opened on February 21, 1905, and the first patients received on March 1, of the same year. About this time, through the interest and generous support of Mr. Victor Bloede, a nurse was appointed to visit the patients in their homes and instruct them in the current methods of prevention.

Table No. I shows the increase in the amount of work the dispensary has done during the first three years. Table No. II the work by month during the first six months of this year. Our patients, as heretofore, have come from many sources. The connection of the dispensary with the large out-patient department of the hospital gives unusual advantages for obtaining abundant and varied material. Patients coming to the clinic for relief are sent directly to the Phipps Dispensary if their symptoms suggest tuberculosis and are transferred from the other departments if the examination points to the presence of the disease. This is the main source of our material. Many cases, however, are referred to us for examination by the visiting nurses, by the agents of the Federated Charities Society, by the State Society for the Prevention of Tuberculosis, by the City Board of Charities, and by private individuals. The visiting nurses have been particularly active in sending other members of the tuberculous patient's family for examination, and in persuading many suspected individuals to come for diagnosis. To their zeal we owe the discovery of many of our earliest cases.

The municipal importance the dispensary has assumed is best illustrated by the statement that one-third of all the cases of tuberculosis reported from the State of Maryland to the Board of Health are reported from the Phipps Dispensary, and over one-half of all the cases of tuberculosis referred from the entire city to the Instructive Visiting Nurses' Association are referred from the Phipps Dispensary. Indeed the dispensary has become a convenient clearing house for the social workers of the city, and while we owe much of our success to their hearty co-operation and assistance the extent of the co-operation is a striking comment on the need and the appreciation of such a special clinic as the Phipps Dispensary.

Table No. I.—Attendance at the Dispensary by Year.

	1905	1906	1907
Total number of cases	639	835	1038
Cases of Pulmonary Tuberculosis	455	501	641
Cases of Tuberculosis other than Pulmonary.	10	18	7
Doubtful cases of Pulmonary Tuberculosis	88	116	276
Non-tuberculous cases	86	159	78

Table No. II.—Dispensary Attendance by Month.

1908	Jan.	Feb.	Mar.	April	May	June
Total No. of visits to Dispensary	821	819	959	876	892	851
No. patients under treatment	318	306	374	316	321	385
No. of new patients registered	117	93	150	127	116	119
No. hours of clinical work	298	324	341	372	413	347
No. of physicians	12	12	13	16	16	13

The distribution of the work of the nurses has undergone a complete change. Previously the nurse connected with the dispensary divided with the two tuberculosis nurses, associated with the Instructive Visiting Nurses' Association, the task

of visiting the tuberculous poor of the city. The Maryland Association for the Prevention of Tuberculosis now supports five nurses who attend to the routine visiting and instructing of the tuberculous. To these we refer all cases not possessing special interest, and through meetings arranged between the dispensary staff and the nurses they learn something of the patients' condition from a medical standpoint, and we, in turn, of their home and social environment. The character of the work the visiting nurses have done and their grasp of the true significance of the work and the fundamental principles involved needs no other comment than the papers read by Miss Lent[1] and Miss LaMotte[2] at the International Congress for Tuberculosis in Washington.

The two special nurses now directly connected with the dispensary give all their time to aid in the careful study and control of particular cases. In the dispensary they attend to the administration of tuberculin, which has become such an important part of the work. They teach patients to take their temperature and pulse and properly record their symptoms. They follow the patients into their homes and supervise the necessary hygienic changes in their mode of living, and see that they understand the instructions they have received, and put them promptly and satisfactorily into practice. Without their aid it would be impossible to get the accurate data so essential for diagnosis or the reliable records and continuous supervision necessary for successful home treatment.

The following figures illustrate the great variety of material which comes to the Phipps Dispensary. Of the 2513 patients registered during the first three years only 1497 were cases of definite pulmonary tuberculosis, 480 were doubtful cases of pulmonary tuberculosis and 325 were cases other than tuberculosis. These figures are the basis for the emphasis we lay upon one special feature of our work, a feature which we believe is more prominent here than elsewhere, namely, the importance given to early diagnosis. The great mass of patients to be seen makes it impossible to study and follow all the cases in the thorough manner desired, so that our attention has been focused particularly upon the early diagnosis of doubtful cases. Tuberculin has lent us invaluable aid in this direction, and we have used it largely as our two special reports show.[3]

Although diagnosis has been and still is the main feature of the work of the dispensary we are gradually developing means for the suitable care of our patients. In 1906 the Phipps Dispensary was formally selected as the examining station for Eudowood Sanatorium and the resident physician, Dr. A. M. Forster, has since then been in attendance at the dispensary three mornings a week to examine applicants. Before the opening of the Bloede Memorial Hospital in December, 1908, only incipient cases were admitted to the sanatorium, and as it is an exceedingly rare occurrence for an early case of tuberculosis to apply for admission, nearly all of the patients were cases discovered and diagnosed in the dispensary. This arrangement gives a satisfactory channel of disposal for a large number of our early cases, and it has filled the sanatorium with a class of favorable patients that cannot be excelled, if rivalled, by any other institution in the country. During the past summer a similar agreement has been entered into between the dispensary and the Jewish Sanatorium at Reisterstown. Dr. Smirnow, its Resident Physician, comes to the dispensary two days a week to select and examine cases for admission and the arrangement promises to be equally and mutually as agreeable as our relation with Eudowood Sanatorium. As the Jewish Sanatorium is principally for advanced cases and the Bloede Hospital for advanced cases at Eudowood has now been opened, about 90 beds are open to Phipps Dispensary patients. These and the accommodations offered at the Municipal Hospital partly supply our need for the care of ill patients, but they are still quite inadequate to meet the demand. As we have so frequently emphasized, the greatest drawback to the successful handling of the tuberculosis problem is the urgent need of more hospital facilities to care for advanced consumptives.

Mr. Victor G. Bloede[4] has called attention to the important rôle the Phipps Dispensary plays in the chain planned by the Board of Directors of the Eudowood Sanatorium to meet local tuberculosis problems. The Sanatorium, the Hospital, the Farm Colony and the Dispensary are the four links.

We have been able in the past two years to devote considerable time to the home treatment of patients unable to find accommodations in institutions. From forty to fifty patients have been constantly under strict supervision,[5] and our results have been very gratifying. Besides the hygienic control of their mode of living many of these patients have been treated with tuberculin and a small number with Marmorek's serum. Reports of our methods and results are now being prepared. Whatever the ultimate decision as to the value of tuberculin may be, we are strongly of the opinion that the tuberculosis dispensaries should furnish the main evidence for the judgment. They have unbounded material to select from and opportunities for testing its value under conditions unequalled by sanatoria or in private practice. We believe that we have demonstrated that it can be used in the dispensary on a large scale without danger and under satisfactory control.

During the two previous winters the dispensary staff and the nurses have met twice a month to discuss the cases under their care and briefly review current tuberculosis literature. Each member of the staff was assigned a certain number of journals and made responsible for a report of any article appearing in them bearing on tuberculosis. So much time

[1] Charities and the Commons. November 7, 1908.
Not yet published.

[3] Archives of Internal Medicine. June, 1908, and May 1, 1909.

[4] Johns Hopkins Hospital Bulletin, December, 1908.

[5] For assisting in the care of these patients, as well as in innumerable other ways, we find ourselves constantly indebted to the Federated Charities' Society.

was consumed in going over each individual case and so many different subjects came up for discussion at each meeting that it was decided to change the plans of the conferences. Dr. Wolman was made chairman of the history committee, which selects for the general meeting only the histories of cases of special interest and those that are incompletely or unsatisfactorily filled out, so that the attention of the responsible members may be brought to them. As chairman of the Literature Committee, Dr. Moss has arranged an interesting and complete program of study, an outline of which appeared in the BULLETIN for March, 1909.

Through additional gifts by Mr. Phipps, it became possible a year ago to start two other important departments of the dispensary: the laboratory for investigation of problems relating to tuberculosis and a library of tuberculosis literature. Two rooms on the upper floor are devoted to the special needs of research and the laboratory is in charge of a trained investigator who devotes all his time to prosecuting and directing original work. Our library now contains about 300 volumes and additions are being constantly purchased.

Four of the physicians connected with the Phipps Dispensary hold appointments in the Johns Hopkins University and give instruction to medical students in tuberculosis from its valuable material. The Phipps Dispensary is largely used for teaching physical diagnosis to students during their third year of study, and special courses in the diagnosis and management of tuberculous patients are also planned for advanced students.

During the first four years of its existence the work of the Phipps Dispensary has increased to such an extent that it has far outgrown the accommodations of the first building. In October, 1908, Mr. Phipps again came to its aid by giving the means necessary to build an addition. The new building is now completed, and occupied.

STATISTICS.

During the first year 639 patients were admitted; during the second year 835; during the third year 1038, giving a total of 2512. Of this number:

1597, or 63. % were cases of definite pulmonary tuberculosis;
480 " 19 % were doubtful cases of pulmonary tuberculosis;
323 " 13 % were cases other than tuberculosis;
35 " 1.4% were cases of tuberculosis other than pulmonary;
75 " 3 % of the histories are too incomplete to be considered.

A closer analysis of the figures for the third year shows that there was less readiness on the part of the staff in diagnosing cases as definitely not tuberculosis, this group forming 17 per cent during the first two years, but only 8 per cent during the third year.

Of the 35 cases of tuberculosis other than pulmonary:
8 are glandular tuberculosis;
9 " pleurisy with effusions;
9 " fibroid pleurisy;
3 " tuberculous peritonitis;
2 " tuberculous pericarditis;
1 is bone tuberculosis;
1 is tuberculous cystitis;
1 " tuberculous adentitis and arthritis;
1 " tuberculous epididymitis.

Of the 323 non-tuberculous cases:
21 had bronchitis and emphysema;
18 " valvular disease of the heart;
15 " adenoids;
4 " lobar pneumonia;
6 " bronchiectasis;
3 " bronchial asthma;
3 " typhoid fever;
3 " chronic tonsilitis;
2 " Basedow's disease;
2 " emphysema;
4 " syphilis;
2 " arteriosclerosis;
2 " pharyngeal catarrh;
1 " nasal obstruction;
1 " carcinoma of the stomach;
1 " chronic interstitial nephritis;
1 " hysteria;
1 " purpura rheumatica;
1 " alcoholic gastritis;
1 " muscular dystrophy;
1 " arthritis deformans;
1 " laryngitis;
1 " goitre;
1 " malaria;
1 " chronic constipation.

In the other cases the examination was negative, and no definite diagnosis was made. The large number of doubtful cases is principally due to the frequency with which patients make only one or two visits to the dispensary, and also to the fact that our doubtful class include those cases in which the diagnosis is highly probable but not absolutely certain. Many patients give the wrong address or live out of the city and cannot be followed. Others refuse to return, even when visited by the nurse and urged to do so.

From the 1597 cases of pulmonary tuberculosis, the following statistics are compiled:

AGE.

From 1 to 5 years	5
" 6 " 10 "	32
" 11 " 15 "	54
" 16 " 20 "	254
" 21 " 25 "	294
" 26 " 30 "	260
" 31 " 35 "	216
" 36 " 40 "	177
" 41 " 45 "	104
" 46 " 50 "	83
" 51 " 55 "	51
" 56 " 60 "	32
" 61 " 65 "	18
" 66 " 70 "	4
" 71 " 80 "	2

Age not stated in 11 cases. Thus:

From 21 to 40 years there are 947 or 59.3 per cent of the cases.

From 16 to 45 years there are 1305 or 81.7 per cent of the cases.

Sex and Color.

White males	763
White females	514
Black males	185
Black females	135
Males	59%
Females	41%
Whites	80%
Blacks	20%

Nationality.

Reference is made to birthplace of the parents. Thus under Germans are those whose parents were German, as well as those of German birth.

Nationality not stated in		73
United States	white	590
	black	320
Germans		220
Russians		165
Irish		82
Poles		28
English		18
Austrians		19
Scotch		5
Greeks		7
Norwegians		5
Mauritian		1
Bavarian		1
Lithuanians		3
Galatian		1
Spaniards		2
Canadians		4
Bohemians		15
Sicilian		1
French		4
Hungarians		5
Italians		8
Hebrew		1
Chinese		1
German Jew		1

Mixed Parentage.

United States and German	17
United States and Irish	5
United States and Russian	3
United States and Bohemian	3
United States and English	2
United States and Hungarian	1
United States and Scotch	1
German and Irish	2
German and French	1
Irish and Italian	1
English and Dutch	1

Of the white patients:

46 % are of American descent;
17 % " " German "
13 % " " Russian "
6.4% " " Irish "
1.5% " " Austrian "

The increase of tuberculous patients in the third year over the two preceding years was almost entirely composed of whites; the number of blacks, per year, remaining almost exactly what it had been.

All of the Russians and Austrians are Jewish, giving roughly 15 per cent of the white patients as Jewish.

Condition.

(Figures from the second and third years only.)

Condition not stated	11
Single	563 = 49%
Married	517 = 44%
Widowed	61 = 7%

Exposure.

FIRST YEAR.

	Cases.
History of unusually intimate exposure	44
History of less intimate exposure	102
History of doubtful exposure	53
No history of exposure obtained	228
No data	18

SECOND AND THIRD YEARS.

Conjugal exposure	36
Intimate association in immediate family	218
Intimate association with patient outside of family	43
Exposure in workshop	83
Incidental exposure	64
No history of exposure obtained	602
No data	106

TOTAL.

History of definite exposure in	40%
History of very intimate exposure in	23%
No history of exposure obtained in	56%

In the third year there was a large increase in the number of cases with exposure in the immediate family. This may be explained by the greater efficiency of the dispensary in the surveillance of families with definitely tuberculous members.

The more carefully a patient's past history is inquired into the more often a definite history of exposure is obtained. Our histories are taken largely by students and other inexperienced assistants and the figures represent a very conservative and probably even a very low estimate.

The Initial Symptoms.

Cough	891
Hæmoptysis	135
Influenza or a "cold"	85
General constitutional symptoms, fever, malaise, "run down," etc	103
Pain in chest	124
Pneumonia	23
Pleurisy	13
Typhoid fever	6
Chills and fever	25
Intestinal disorders	14
Dyspnoea	20
Measles	3
Hoarseness	4
Pertussis	3
Enlarged glands	4
Sore throat	10
Bronchitis	3
Dengue	1
Coryza	1

Rheumatism	1
Palpitation of the heart	1
After trauma	1
Pains elsewhere than in chest	5
Sweats	5
Cough and pain	35
Cough with other symptoms	6
Vomiting	6
Nervous trouble	2
Indigestion	3
Swollen limbs	1
Enlarged abdomen	1
Loss of weight	6
Not stated	58

58 % of cases begin with cough;
8.4% " " " " hæmoptysis;
8.5% " " " " constitutional symptoms;
10 % " " " " pain in chest;
5 % " " " as influenza;
1.4% " " " " pneumonia;
1.5% " " " with chills and fever.

The Occurrence of Important Symptoms.

Cough present in all cases except	68
Hæmoptysis in 775 cases	48.5%
Digestion impaired in	588 or 37 %
Sweats in	974 or 61 %

Stage of Disease.

Although Turban's scale was made the standard of comparison, the figures for the second year were compiled by so many different observers that they are not more than roughly accurate. If error has been made, it is in too lenient interpretation. Many cases placed in the first stage belong to the second, and many in the second to the third. The figures for the first and third years have, I believe, been more justly apportioned.

First stage:	first	year,	66	second	year,	154	third	year, 152
Second stage:	"	"	160	"	"	171	"	" 130
Third stage:	"	"	214	"	"	155	"	" 330
Not stated:	"	"	5	"	"	31	"	" 29

Condition of Patients on Admission.

The prognosis made at the time of the first examination gives some idea of the condition of the patient on admission.

Good prognosis given: First year, 50; second year, 57; third year, 87; total, 194=12 per cent.

Doubtful prognosis given: First year, 56; second year, 58; third year, 143; total, 257=16 per cent.

Bad prognosis given: First year, 338; second year, 330; third year, 395; total, 1063=67 per cent.

No prognosis given: First year, 1; second year, 66; third year, 16; total, 83=5 per cent.

Duration of Symptoms Before Admission.

1 to 3	months	269	or 16%
3 " 6	"	276	" 17%
6 " 12	"	291	" 18%
1 " 2	years	259	" 16%
2 " 5	"	244	" 15%
5 " 10	"	108	" 7%
Over 10	"	35	" 2%

Again these figures are valuable only as indications. As is well known, the more searching our inquiries are the longer the duration of symptoms will appear. Ignorant patients, and particularly colored patients, date their illness only from the beginning of serious symptoms.

Complications.

tuberculous.

Laryngitis	95
Bone tuberculosis	17
Pleurisy	33
Ischio-rectal abscess	3
Meningitis	1
Pulmonary fistula	1
Enteritis	3
Otitis media	3
Sinus over sternum	1
Adenitis	11
Peritonitis	3
Fistula	1
Kidney	1
Pneumothorax	2
Hæmaturia	1

non-tuberculous.

Bronchitis and emphysema	9
Pregnancy	9
Mitral insufficiency	3
Aortic insufficiency	5
Laryngitis	1
Insanity	1
Bronchitis	1
Syphilis	4
Herpes zoster	1
Arteriosclerosis	8
Alcoholism	2
Hiccough	1
Hernia	4
Gonorrhœal exostoses	1
Gout	1
Emphysema	1
Mitral stenosis	1
Diabetes	1
Pharyngeal ulcer	1
Pernicious anemia	1
Pneumonia	1
Mitral stenosis and aortic insufficiency	1
Neuritis	1
Diarrhœa	1
Neurasthenia	1
Epistaxis	1

Probably many complications have been omitted. Where a large number of men are engaged in making records, many details are sure to be overlooked.

Results.

The regular visiting of patients by the nurses has given us unusual facilities for following them. The results in all cases, whether sent to a sanatorium or remaining at home under good or bad surroundings, are given below. Only so small a proportion entered institutions, however, that the number is practically negligible.

I. Cases followed for from 3 to 3½ years:

Number of cases of pulmonary tuberculosis in first six months	259
Patients living out of city or lost	102
Number of patients followed	157
Of these are dead	137 or 87%
Of these are living	20 or 13%

Of the 20 living: 4 are improved, 11 remain unchanged, 5 were worse.

II. Cases followed for from 2½ to 3 years:

Number of cases of pulmonary tuberculosis in second six months	171
Patients living out of city or lost	71
Number of patients followed	100
Of these are dead	81 or 81%
Of these are living	19 or 19%

Of the 19 living: 6 are improved, 4 remain unchanged, 9 were worse.

III. Cases followed for from 2 to 2½ years:

Number of cases of pulmonary tuberculosis in third six months	249
Patients living out of city or lost	112
Patients followed	137
Of these are dead	91 or 66%
Of these are living	46 or 34%

Of the 46 living: 16 are improved, 17 remain unchanged, 14 are worse.

IV. Cases followed for from 1½ to 2 years:

Number of cases of pulmonary tuberculosis in fourth six months	239
Patients living out of city or lost	138
Number of patients followed	101
Of these are dead	50 or 50%
Of these are living	51 or 51%

Of the 51 living: 21 are improved, 14 remain unchanged, 16 are worse.

MARMOREK'S SERUM IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

By SAMUEL WOLMAN, M. D.,
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Attempts to utilize the serum of animals in the treatment of tuberculosis have not been few. At first the natural sera of animals immune to or greatly resistant to the disease were experimented with. The next efforts were directed towards the artificial immunization of the animals whose sera were to be employed; and various forms of the tubercle bacillus, its derivatives or culture products were used as immunizing agents. Only two sera, however, have recently held medical attention for more than a brief period—Maragliano's and Marmorek's. For the first there are now no sponsors except a few of Maragliano's own countrymen. But a considerable number of publications attesting the value of Marmorek's serum have within the last five years kept that product from the fate of its fellows.

According to Marmorek[1] himself, the efficiency of his serum is due to his choice of a proper antigen or immunizing substance. He was led to the choice of his antigen by careful and extensive studies of the biology of the tubercle bacillus, and by a critical attitude towards the prevailing theory as to the action of tuberculin. He reasons that in order to obtain an antitoxin to the substance causing the symptoms of tuberculous patients, we must first have in our possession that substance which the bacillus secretes while growing in the human tissues. Tuberculin, which is found in old cultures of the tubercle bacillus, he does not regard as the true toxin of tuberculosis, both because the bacillus in such cultures is in a condition much different from that in the human body, and also on account of what is known of the action of tuberculin. Animals that have not been infected with the tubercle bacillus, tolerate enormous quantities of tuberculin with no unpleasant effects. On the other hand, if the animal has only a slight lesion, a minute quantity of tuberculin produces intense constitutional disturbance—the so-called tuberculin reaction. Thirdly, if the tuberculous process is extensive, even large doses of tuberculin may elicit no reaction. Marmorek argues that if tuberculin were the real symptom-producing substance in tuberculosis there would not be such an enormous difference between its action in uninfected animals and in animals or men with only a slight lesion. On the one hand the introduction of large doses into healthy animals should produce definite symptoms; on the other hand, the introduction of an extremely minute dose into an animal with a very slight lesion should not produce violent effects. It is known too that one of the component events of the tuberculin reaction is "the focal reaction"—an intensification of the physical signs at the tuberculous focus. This focal reaction Marmorek thinks is unexplained by the addition of a minimal amount of toxin to the body; yet it occurs after extremely small doses of tuberculin. He believes it more in accordance with the known facts to regard tuberculin as a substance which upon entering the body stimulates the tubercle bacilli—if they are present—to secrete more actively the true tuberculous toxin. The consequent reaction is due, then, not to the tuberculin but to the substance thereupon secreted. He cites certain experiments of his own as supporting this view of the rôle of tuberculin.[2]

In order to obtain the true tuberculous toxin, he deemed it necessary to furnish the bacillus with a proper habitat. Such a habitat is furnished by his leucotoxic serum, obtained by immunizing the calf against the leucocytes of the guinea-pig. His object was to select a medium in which the bacillus

[1] Marmorek: Arch. gén. de méd., 1903, No. 47; Berl. klin. Wchnschr., 1903, No. 48; Lancet. Lond., 1903, December 12.

[2] Marmorek: Arch. gén. de méd., 1903, No. 52.

would find it difficult to grow. By gradually accustoming itself to this medium the bacillus will become more hardy and secrete more actively. Since the bacillus in animal tissues secretes its noxious substance while surrounded by, or enclosed in leucocytes, the leucocyte must furnish something that facilitates the growth of the organism. An anti-leucocytic serum he expects will therefore produce a resistant strain of bacilli, especially if the leucocytes of the guinea-pig, an animal so susceptible to tuberculosis, be used. In order to enhance the peculiar properties of his leucotoxic serum, he adds thereto a glycerine-bouillon extract of liver—an organ which is especially resistant to the tubercle bacillus. By cultivating the ordinary bacillus of Koch on this medium, Marmorek obtains his "young or primitive bacillus," which differs from the other tinctorially and biologically.[3] Its waxy capsule is thinner, it is not so acid fast, it grows in a finer, smoother film, lacks the characteristic odor, and secretes, very early, not tuberculin, but Marmorek's antigen. The filtrate of these primitive cultures, unlike tuberculin, is fatal to healthy guinea-pigs or rabbits, and in tuberculous animals it produces not a "reaction" but symptoms much the same as in healthy animals, sometimes to a less degree. With this filtrate he immunizes horses, and obtains a serum which he says is an anti-tuberculous, not an anti-tuberculin, serum. The reactions are violent, and it takes about eight months to raise the serum to a utilizable strength. The recent serum is said to be more potent, because of the gradual perfection of the cultures of the primitive bacillus. The serum has been further strengthened by immunizing the horses at the same time against streptococci found in the sputa of tuberculous patients with mixed infection. Marmorek's experiments with the serum before he applied it to human therapy showed that in animals it could act both preventively and curatively, provided in either case the interval is not too long (about three days). In animals the serum is most potent when given intravenously.[4]

Marmorek's antituberculous serum is furnished in bottles of 5 cc. each. There are two varieties—simple and double—the latter containing also antistreptococcic substances. Its first application in human therapy was by the subcutaneous route. Five or 10 cc., sometimes more, were injected daily. In many of the patients after only a few injections, there occurred intense local and general symptoms. There were much pain and swelling at site of injection, and fever, malaise, nausea and vomiting, arthralgias and eruptions (erythematous and urticarial mainly) attended often by intense itching. Sometimes even collapse was threatened. These untoward effects were thought to be due to the specific antibodies of the serum—a fact which would have militated against even any tentative use of the remedy. But from the work of von Pirquet and Schick, and others, it is now known that the symptom-complex is due to the normal constituents of serum, and is the same as that occurring in "serum disease." The phenomenon is a general one, embraced under the term "anaphylaxis," and is thought to be one of the immunity reactions of the body. It has not heretofore attracted attention in sero-therapy, since such therapy had been limited almost entirely to acute diseases, in which the application of the serum was not extended over more than a few days at the most. Here for the first time was an anti-toxin to be applied to a peculiarly chronic disease in which there was need for a steady and prolonged neutralization of continually accumulating toxic substances. Further work showed that the anaphylactic phenomena could be almost entirely avoided by a proper regulation of dose and interval. Those who have used the subcutaneous route most, advise that 5 or 10 cc. be given at intervals of one or more days for about three weeks. Then after a pause of about two weeks, the cycle is again begun. This scheme may be departed from in either direction, as determined by the tolerance of the individual patient.

The serum has been administered also by mouth. No one now speaks for the efficiency of this method. The rectal method was simultaneously recommended by Frey[5] (Davos), and by Mannheim and Hoffa.[6] After evacuation of the bowel, 5 to 20 cc. are injected into the descending colon by means of a syringe to which is attached a long rubber catheter. The serum is given daily for about three weeks. Then follows a pause of about two weeks. This period of administration is selected with a view towards preventing anaphylactic phenomena, but it is known that it may be departed from without the appearance of such symptoms. The rectal method is not only painless, but time saving in that it does not require the rigid asepsis of the subcutaneous method. Nor have arthralgias or eruptions been noted except rarely, and then only in mild form. In some patients there occurs after a time a local irritation of the bowel resulting in abdominal pain, tenesmus, or diarrhœa. Or, without any previous pain, the serum may be expelled shortly after its introduction. In such an event a few drops of laudanum are mixed with the serum when it is given. Should the symptoms then continue, the administration is interrupted for a brief period. Most patients have received the rectal injections, over long periods, without any discomfort whatever. The absence of any symptoms of serum disease when the serum is given rectally, while no doubt an advantage in itself, has led some writers to deny that there is any absorption of even the specific anti-bodies which the serum is said to contain. They point to the work of Escherich with diphtheria antitoxin, which showed that diptheric anti-bodies were not absorbed from the lower bowel. Similar evidence exists also for anti-tetanic serum. The question is in dispute, and all that need be said here is that most of the enthusiasts who have seen the therapeutic effects of the serum, find that they can work cures even when the serum is given rectally. Some authors recommend a combination of the two routes.

[3] Marmorek: Berl. klin. Wchnschr., 1906, No. 11.
[4] Marmorek: Berl. klin. Wchnschr., 1907, No. 20.
[5] Frey: München. med. Wchnschr., 1904, No. 44.
[6] Hoffa: Berl. klin. Wchnschr., 1906, February 19.

The serum has also been injected intravesically in a case of cystitis;[7] and in meningitis it has been given intraspinally.[8]

Marmorek reported the first cases treated with the serum in 1903, at a session of the Paris Academy of Medicine. Since then about 80 reports have appeared. The latest collections of literature have been made by Köhler,[9] and by Frey,[10] in 1908. The evidence is extremely conflicting, and the authors both from their own work and from a review of the literature arrive at opposite conclusions as regards the value of the serum. Frey notes that of the 70 reports, 59 are favorable—and these deal with 833 cases, while the unfavorable conclusions rest on experience with 105 cases. There is the widest divergence of views, some writers, as Faraggi,[11] and Kohler and Jacobson[12] reporting cures of tuberculous pneumonia, while others, as de la Camp,[13] Stadelmann and Benfey,[14] and Mann,[15] see no good effects whatever, even in ordinary cases. Frey's summary is certainly too favorable, for he includes in his positive reports those which simply declare themselves in favor of further tests. The lack of sufficiently full descriptions of the lesion, especially in pulmonary tuberculosis, and the looseness with which the terms "cure" or "improvement" are used, make it difficult to estimate the value of the reports. The difficulty is enhanced by the very nature of the disease. Moreover, nearly all of the patients treated were at the same time receiving the benefits of the hygienic and dietetic cure. Some authors, it is true, report astonishingly rapid recoveries with practically no interruption of the usual occupation of the patients, and with no essential change in their mode of life. The most enthusiastic advocates of the serum are Frey,[10] and Ullman.[16] More moderately, but still favorably disposed are Hoffa,[17] Monod, Stephani,[18] Röver.[19] The more recent publications are certainly unfavorable, especially those of Sokolowski and Dembinski,[20] Grüner (loc. cit.), Köhler (loc. cit.), Kaufmann,[21] and Ganghofner.[22]

The evidence in favor of the efficiency of the serum is stronger for surgical than for pulmonary tuberculosis, although there is no lack of contradiction even in the surgical group.

Grüner's experience in the treatment of tuberculous meningitis leads him to deny any virtues to the serum. He argues at some length that the serum contains no specific anti-bodies, because when mixed with tuberculin it does not inhibit the latter from producing the von Pirquet reaction. But it is only fair to note that Marmorek especially designed the serum so that it should contain no anti-tuberculin, and it cannot, therefore, be expected to neutralize tuberculin, even if it does contain the anti-bodies planned by Marmorek.

There is now fair unanimity that apart from the anaphylactic effects—which with care can be avoided—the serum is not injurious. Kaufmann, however, in a very recent article dissents strongly. On the basis of his work with Marmorek's serum, and with natural horse-serum, he declares that the heart is frequently injured (this injury, however, he does not attribute to anti-bodies). In fact, a rise of pulse-rate has been noted by many who speak favorably of the remedy. Kaufmann includes among the effects of natural horse-serum (even when given rectally) gastric and intestinal disturbances, nephritis, fever and exacerbation of tuberculous lesions.

Marmorek himself has pointed out that hemoptysis has not occurred during treatment with serum. This was true until Köhler's last series, which, in 60 cases, showed seven with hemoptysis, one of which was fatal.

Evidence has been sought from the laboratory to sustain the claim that the serum contains specific anti-bodies. Röver (loc. cit.), by enumerating leucocytes after Arneth's method, finds that the percentage of neutrophiles with 3- or 4-lobed nuclei rises in patients treated with the serum. Arneth would interpret this as meaning that there was a decreased demand upon the leucocytes for anti-bodies; that is, that anti-bodies were being supplied presumably by the serum. Kaufmann finds the change in the neutrophile picture not so uniform, nor when it occurs, is it always consistent with the clinical phenomena. According to Pfeiffer and Trunk[23] there is an increase in specific agglutinins in the blood of patients under treatment; an increase not accounted for by the agglutinin content of the serum itself, which is rather low. They also demonstrate by the method of complement fixation an increase of anti-tuberculin—which they think may be explained by the presence of small quantities of tuberculin in Marmorek's antigen, or as a group reaction. A rise in the opsonic index is claimed by Bosanquet and French,[24] Baer,[25] and Horner,[26] However. the meaning, if not the very existence, of these laboratory entities is still in question.

All of the patients treated by us received the serum rectally, in accordance with the regulations sent to us by Dr.

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[7] Clement and Jacobson: J. des Praticiens, 1908, No. 6.
[8] Grüner: Wien. klin. Wchnschr., 1908, No. 38.
[9] Köhler: Ztschr. f. Tuberk., 1908, Bd. XIII, Ht. 2.
[10] Frey: Ztschr. f. Tuberk., 1908, Bd. XIII, Ht. 2.
[11] Faraggi: Progrès méd., 1907, No. 14.
[12] Kohler, Levy et Jacobson: J. des Praticiens, 1905, December 16.
[13] De la Camp: Berl. klin. Wchnschr., 1905, No. 44.
[14] Stadelmann u. Benfey: Berl. klin. Wchnschr., 1906, No. 4.
[15] Mann: Wien. klin. Wchnschr., 1906, No. 42.
[16] Ullmann: Wien. klin. Wchnschr., 1905, No. 22; Ztschr. f. Tuberk., 1907, Bd. X, Ht. 2; Ztschr. f. Tuberk., 1907, Bd. XII, Ht. 1.
[17] Hoffa: Berl. klin. Wchnschr., 1906, No. 44.
[18] Stephani: Progrès méd., 1905, No. 25.
[19] Röver: Beitr. z. Klinik d. Tuberk., Bd. V, Ht. 3.
[2] Sokolowski u. Dembinski: Ztschr. f. Tuberk., Bd., XIII, Ht. 2.
[21] Kaufmann: Beitr. z. Klinik d. Tuberk., Bd. XI, Ht. 3.
[22] Ganghofner: Wien. klin. Wchnschr., 1909, No. 3.
[23] Pfeiffer u. Trunk: Ztschr. f. Tuberk., 1907, Bd. XI, Ht. 4.
[24] Bosanquet and French: Brit. M. J., Lond., 1907, April 13.
[25] Baer: München. med. Wchnschr., 1907, No. 34.
[26] Horner: Wien. med. Wchnschr., 1908, No. 50.

Marmorek. After a normal evacuation of the bowels, the serum was injected high into the colon by means of a rubber catheter attached to a glass syringe. The dose of serum was followed by enough water to ensure the utilization of the entire dose. The tolerance to this method of administration was excellent. In only one case did we find it necessary to resort to the admixture of laudanum with the serum, on account of a tendency to diarrhœa. In no case did we meet with abdominal pains which might be ascribed to the treatment. In several instances, however, numbness of one or both lower limbs was complained of during treatment. As regards adverse constitutional effects, only in Case X was there a hint of a malignant action on part of the serum. Here, the dose was followed by high fever, anorexia, general pains, increased cough and expectoration.

The amount injected varied from 5 to 15 cc. The dose was regulated by the ability of the patient to retain it, and, as far as we could judge, by the general condition of the patient. As a routine cycle, we adopted a period of 21 days, followed by a pause of 14 days. But these periods were departed from, in individual instances, our guide being the tolerance of the patient for the serum, as far as it could be clinically determined. In one case the serum was given continuously over thirty-five days, with the exception of Sundays.

Our report is limited to 19 cases, all, except one, patients at the Phipps Dispensary. More patients were treated, but on account of the difficulties in properly controlling an outpatient (ambulant) clinic, the treatment in some cases was interrupted at too early a stage to permit of these cases being used in this study. One case was treated for the usual length of time, but immediately after the treatment she succumbed to acute leukemia, and was therefore excluded from the series. As regards the duration of treatment, in some cases this was shortened by the caprice of the patient. The short courses given to the advanced cases were due to the fact that when no antitoxic effect on the symptoms was noticed, we thought it injudicious to expend another course of serum on that patient, since there was no reason then to expect any change in the lungs themselves. To explain the selection of the cases, we may say that the advanced cases were chosen with a view to testing the symptomatic effect of the serum acting purely as a neutralizing agent of the tuberculous toxins. At the instance of Dr. Marmorek, we then treated early cases. Some of these, with no or very few symptoms, we hoped would respond by an amelioration of the physical signs. However, improvement was so slow, if it occurred at all, that we were puzzled as to how much was due to rest and hygiene. For although we made no especial effort to change the mode of life of the patients treated with the serum, yet the daily attendance at the clinic was incompatible with the pursuit of a livelihood. As a result of this doubt, we then treated some patients that had passed beyond the early stage, but were not so sick as the very advanced cases.

A description of each case, somewhat in detail, is given at the end of this paper. We will here summarize the results:

Six advanced cases were treated. Of these, four continued to get worse, even while receiving the serum. Two of these four have since died, one is now dying, and one, while not moribund, is quite sick. These four cases are described as Cases XIV-XVII.

In one of the six, Case XIX, there was apparently no change during treatment, but the physical signs have since become much more marked. Case XX alone showed any beneficial effects. Here, during each course of the serum, there was an amelioration of the cough. The general condition remained unchanged. We may say, then, that out of the six advanced cases, in only one could we detect any favorable effects on the symptoms.

Of the six moderately advanced cases, four (Cases VIII-XI) continued to deteriorate under treatment. Two of these have since died. In Case X, the administration of the last doses of the serum was attended by a sudden exacerbation of the patient's symptoms. In one case (XII) there was no apparent change. Case XIII is the only one of the six that showed any improvement. This case is the most striking of the series in that there was a sudden change for the better simultaneously with the administration of the serum. Unfortunately the patient was so elated at the good results that she refused to return for further treatment. She has since disappeared.

Seven early cases were treated (I-VII). Three of these are worse (III-V). Case III is doing very badly. Case IV has had an extension of the signs, and also pleurisy with effusion. A distressing cough, which was in no wise lessened by the serum, seems to be yielding to tuberculin, which is now being given to this patient. Case V has since died. This patient, while showing only moderate physical signs, went downward with amazing rapidity. Two of the seven (I-II) showed no change under treatment. Of these, Case I had no symptoms, and we were unable to detect any decrease of the pulmonary signs as an effect of the serum. Only two (VI, VII) of the seven cases can be considered as having improved at all, and in both, the decision is rather dubious. Case VI, although having received 330 cc. of the serum, showed an increase of the signs. There was an improvement, however, in the fever, cough and sputum. Case VII received 530 cc., was under treatment $4\frac{1}{2}$ months, and then showed a slight improvement in the signs. The symptoms were not changed. Considering the early stage of Cases VI and VII, and the comparatively long period of care that each had, we cannot see that even the slight beneficial effects can with certainty be ascribed to the serum.

We must conclude that in the seven early cases, we could not definitely ascribe any beneficial effects to the serum. Nor did the serum prevent even some of the early cases from doing badly. No good effects on even slight physical signs were evinced, even when the patient had few or no symptoms. In the twelve advanced cases, only two showed an improvement in symptoms, which might be ascribed to the serum. In the remainder, the severity of the symptoms underwent no dimi-

nution. Of anatomical improvement there was in no case any evidence except in Case XIII. On the other hand, we cannot say that the serum has had any adverse effects.

We must express our thanks to Dr. Marmorek for his kindness in putting the serum at our disposal, and our sincere regret in not being able to confirm the excellent results observed by some writers. A protocol of the cases follows:

Case I.—No. 3216. M. Z., male, age 21, admitted August 8, 1908. Constitutional and focal reaction to tuberculin.

Lungs.—Right: clear. Left: impaired percussion note and medium-sized moist râles from middle interscapular region to base. On admission had slight cough and hemoptysis. After one month of observation, no symptoms, but the physical signs persist.

Serum.—One course of 210 cc. Duration of treatment 18 days.

Result.—No symptoms. Signs remain unchanged. Patient well.

Case II.—No. 3203. S. S., female, age 23, admitted August 5, 1908. Just prior to admission had been operated on for pelvic tuberculosis. History of cough for three months and slight hemoptysis.

Lungs.—A few transient râles above each clavicle, and in each supraspinous fossa. On admission had thoracic pains, cough, blood-streaked sputum, and a maximum temperature of 100° F. Weight, 156 lbs.

Between August 8 and August 28, 155 cc. serum. Râles now heard to second rib on each side. Cough and pain unchanged. Temperature, 99.4° F. Weight, 163½ lbs.

Between September 14 and September 23, 70 cc. serum. Temperature, 100° F. Cough and pain worse. Weight, 170 lbs. Slight hemoptysis.

October 16. Weight, 173 lbs. Râles have appeared also in each upper interscapular region. Temperature, 100.4° F.

October 19 to November 9, 205 cc. serum. Temperature not above 99° F. Weight, 173 lbs. Cough bad. Râles in left side now reach to third rib.

March, 1909. Patient in same condition as on admission, except as regards weight. Temperature often over 100° F. Cough and pain unchanged.

Summary.—Pulmonary and pelvic tuberculosis. Gained weight. Otherwise no improvement. Serum 430 cc.—given over a period of twelve weeks.

Case III.—No. 14. C. S., female, age 38, admitted March 3, 1905. Sputum showed tubercle bacilli. This patient had been receiving tuberculin from July, 1907 until February, 1908, when she began to lose weight, showed fever and an increase of physical signs.

On February 21, 1908, the temperature had risen to 100.4° F. Cough was frequent and troublesome. Weight, 114 lbs.

Lungs.—Right: a few râles in supraspinous fossa. Left: impaired note and moist râles to fourth rib and to middle interscapular region.

February 21 to March 12, 120 cc. serum. Weight, 115 lbs. Fever somewhat lower. Cough and signs unchanged.

March 27 to April 13, 110 cc. Weight, 115 lbs.

May 2 to May 22, 190 cc. Weight, 113½ lbs. Is weak. Cough not improved. Temperature, 100.7° F. Signs increasing.

Summary.—An early case, which had been doing well on tuberculin. A sudden change for the worse, which was not arrested by 420 cc. of serum, given over a period of three months. Patient is now doing badly.

Case IV.—No. 2736. E. N., female, age 18, admitted April 13, 1908. Sputum shows tubercle bacilli. Gives history of cough for six weeks. Temperature, 101.4° F. Weight, 174 lbs. Bad cough. Appetite poor. Received diagnostic doses of tuberculin.

Lungs.—Moist râles above left clavicle, and from spine of left scapula to base, most numerous in interscapular region.

On July 28, temperature, 100° F. Weight, 162 lbs. Persistent hacking cough. The râles in front now reach to third rib.

July 28 to August 15, 125 cc. of serum. Weight, 165 lbs. Temperature, 99.4° F. Cough still bad. Lungs unchanged.

August 31 to September 18, 155 cc. of serum. Temperature, 99.4° F. Cough is worse. Lungs unchanged. Weight, 165 lbs.

October 13 to November 2, 235 cc. of serum. Temperature, 99.4° F. Cough unchanged. Weight, 166 lbs. Lungs unchanged.

March, 1909. Patient no better. Has since had a large pleural effusion on the right side.

Summary.—An early case with bad cough. No effect on signs or symptoms. Has not done well since. 515 cc. of serum given during twelve weeks.

Case V.—No. 3237. H. B., male, age 25, admitted August 12, 1908. Sputum shows tubercle bacilli. Duration of symptoms, one year. Temperature, 99.8° F. Weight, 121 lbs. Has bad cough, occasional vomiting and diarrhœa.

Lungs.—Right: impaired percussion note to third rib, and to fourth spine. Breath sounds suppressed. A few fine râles above and below clavicle and in each supraspinous fossa. Left: impaired note, suppressed breath sounds and scant moist râles to third rib and to fourth spine.

August 21. Temperature, 99.8° F. Weight, 118½ lbs. Slight cough. Appetite poor. Vomits.

August 21 to September 10, 180 cc. of serum. Feels stronger. A little cough. Appetite good. Lungs unchanged. Weight, 118 lbs.

October 6 to October 27, 195 cc. of serum. Temperature, 101.6° F. Weight, 113 lbs. Much vomiting. Weak. Lungs unchanged.

November 7. Lungs, same. Looks emaciated. Temperature, 101° F. Much vomiting. Died, December 10, 1908.

Summary.—Early case, with vomiting. Steadily worse. 375 cc. of serum given during nine weeks.

Case VI.—No. 2466. W. K., male, age 21, admitted February 14, 1908. Sputum shows tubercle bacilli. Symptoms since one year. Has had hemoptysis and cough. Temperature, 99.7° F. Weight, 128 lbs.

Lungs.—Left: clear. Right: slight impairment of note and scant clicks to second rib.

July 21. Fever has continued, although in bed four weeks. Temperature, 100.2° F. Weak, much cough. Weight, 137 lbs.

July 21 to August 10, 125 cc. serum. Fever continues. Cough better. Weight, 138 lbs.

August 25 to September 14, 205 cc. of serum. Fever only occasionally. Cough decreased. Weight, 143 lbs.

Lungs.—Râles much increased to third rib and to lower interscapular region.

March, 1909. Is doing well.

Summary.—Early case. Symptoms improved. Signs increased. 330 cc. of serum during seven weeks.

Case VII.—No. 2022. M. S., male, age 47, admitted September 17, 1907.

Lungs.—Dullness and moist râles to second rib and spine of scapula on right side. Also a few râles in right interscapular area and at left apex. Steady cough and expectoration. Night sweats. Dyspnea. Poor appetite. Temperature, 100° F. Weight, 136 lbs.

Between December 27 and January 18, 105 cc. of serum.

Between February 6 and February 26, 143 cc. of serum.

Between March 16 and April 4, 150 cc. of serum.

Between April 20 and May 9, 175 cc. of serum.

Duration of treatment, 4½ months. Received 530 cc.

Result.—Cough about same. Appetite bad. Fever only slightly reduced. Weight, 146 lbs. Signs only slightly better.

Patient was then sent to the country and is doing well.

Case VIII.—No. 2237. C. A., male, age 18, admitted December 6, 1907. Sputum, negative. Bad cough and expectoration. Appetite bad. Sweats. Weight, 104 lbs.

Lungs.—Right: clear. Left: impaired note and moist râles to third rib and to spine of scapula. Also at base of axilla.

January 3 to January 25, 105 cc. of serum. Both signs and symptoms have increased. Weight, 100 lbs.

Patient died.

Case IX.—M. M., male, age 40, admitted December 22, 1907. Bad cough and expectoration. Weakness. Fever. Loss of weight. Sputum positive.

Lungs.—Right: impaired note and moist râles to third rib and to middle interscapular area. Left: clear.

February 19 to March 11, 125 cc. of serum. Patient is worse in signs and symptoms. Has since died.

Case X.—No. 3064. A. B., male, age 26, admitted July 3, 1908. Duration of symptoms, four months. Sputum, positive. Frequent cough. Abundant sputum. Temperature, 100° F. Weight, 136 lbs.

Lungs.—Right: impaired note, blowing breath sounds, and moist râles to second rib, and in supraspinous fossa. Left: moist râles and slight impairment from angle of scapula to base.

August 14 to September 1, 160 cc. of serum. Temperature, 101.2° F. Cough increased. Appetite poor.

September 17 to October 6, 115 cc. of serum. Temperature, 99° F. Feels better.

October 27 to October 28, 10 cc. of serum. Fever rises to 104° F. General pain. Anorexia. Increased cough and expectoration. The physical signs have increased on both sides. Weight, 140 lbs. Patient has not been doing well since.

Summary.—Moderately advanced. Received 285 cc. of serum, over ten weeks. Symptoms not at all improved. Physical signs decidedly worse. Last two doses seem to have caused a reaction.

Case XI.—No. 2236. C. H., male, age 20, admitted December 6, 1907. Sputum positive. Duration of symptoms, six months. Slight cough and expectoration. Weight, 137 lbs.

Lungs.—Right: impaired note to third rib and to fifth spine. Breath sounds blowing. Moist râles in second interspace and in lower axilla. Left: impaired note to third rib and in supraspinous fossa. Breath sounds here suppressed. Moist râles in entire front and to angle of scapula.

January 9. Weight, 140 lbs. No fever. Slight cough. Signs unchanged.

January 9 to January 30, 105 cc. of serum.

February 15 to March 6, 180 cc. of serum.

March 21 to April 9, 135 cc. of serum.

April 27 to May 15, 175 cc. of serum.

May 15. Weight, 134 lbs. No fever. Cough unchanged. Physical signs have increased. Patient has not done well since. Has lost weight and has had hemoptysis and fever.

Summary.—Moderately advanced case, with only slight symptoms and no fever. Was not at work and lived under good conditions. The signs increased under treatment, and patient has not done well since. Received 595 cc. of serum over a period of five months.

Case XII.—No. 1217. S. P., male, age 19, admitted October 30, 1906. Sputum positive. Received tuberculin treatment from December, 1906, to April, 1907. His physical signs had undergone no change. Had no fever, only slight cough, but showed dyspnea on exertion.

Lungs.—Right: impaired note and moist râles to fourth rib and in interscapular area. Left: no râles, but note is impaired over lobe and breath sounds are suppressed.

August 30 to October 1, 1907, 270 cc. of serum. The dyspnea was not removed. There was no change in the physical signs.

Case XIII.—No. 2191. L. H., female, age 28, admitted November 21, 1907. Sputum positive. Duration of symptoms, three months. Is very pale. Has much cough and expectoration. Appetite poor. Night sweats. Has lost weight. Now weighs 108 lbs.

Lungs.—Right: impaired note and moist râles to fourth rib and to angle of scapula. Breath sounds roughened. Left: a few crackles above the clavicle.

December 30. Has been on a good diet. Weight, 108 lbs. Cough not better. Dyspnea, chills, sweats, pains. Signs unchanged.

December 30 to January 27, 110 cc. of serum. Pallor has now much decreased. Appetite good. No chills or sweats; cough and sputum decreased. Weighs 108 lbs. Sputum shows no tubercle bacilli.

Lungs.—Right: percussion note and breath sounds unchanged. Râles only above clavicle and to spine of scapula. Left: clear.

March 19, 1908. Signs are increasing, but feels well. Patient has been reported to be doing well.

Case XIV.—No. 1825. L. J., female, age 20, admitted July 11, 1907. Sputum positive. Duration, six months. Temperature to 99° F. Weight, 109 lbs. Bad cough and expectoration. Dyspnea. Night sweats.

Lungs.—Right: percussion note impaired in both upper backs. Moist râles throughout both fronts and in both upper backs. No tubular breathing.

August 26. Weight, 112 lbs. Pulse, 148. Temperature to 100° F. Symptoms unchanged.

August 26 to September 30, 300 cc. of serum.

September 30. Weight, 111 lbs. Pulse, 144. Temperature, 99° F. Symptoms unchanged. No change in physical signs. Gradually grew worse. Died, December 6, 1908.

Case XV.—No. 2882. A. T., female, age 18, admitted May 18, 1908. Sputum positive. Duration seven months. Bad cough and expectoration. Hemoptysis. Dyspnea. Poor appetite. Temperature, 100° F. Weight, 99½ lbs.

Lungs.—Right: transient râles to second rib and in supraspinous fossa. Note here markedly impaired. Left: marked impairment of note and moist râles to fourth rib and to upper interscapular region.

May 20 to June 9, 215 cc. of serum.

June 2 to July 3, 75 cc. of serum. The signs have increased. Patient feels worse. Weight, 100 lbs. Has since gone down rapidly.

Summary.—Advanced case. Received 290 cc. of serum in seven weeks. Physical signs worse. Symptoms not improved.

Case XVI.—No. 1784. C. P., male, age 28, admitted June 22, 1907. Sputum positive. Duration ten months. Bad cough. Hemoptysis. Dyspnea. Temperature, 101° F. Weight, 145 lbs.

Lungs.—Right: a few moist râles above and below clavicle and in supraspinous fossa. Left: moist râles and impaired note to fifth rib and to angle of scapula.

August 28. Temperature, 102° F. Weight, 132 lbs. Marked dyspnea. Chills. Bad cough.

August 28 to September 21, 195 cc. of serum. Symptoms not at all improved. Died October 17.

CASE XVII.—No. 2344. E. K., male, age 22, admitted January 8, 1908. Sputum positive. Duration five years. Temperature, 99.4° F. Weight, 130 lbs.

June 2. Temperature, 100° F. Weight, 130 lbs. Has been taking tuberculin, but has not done well. Pale and weak. Bad cough.

Lungs.—Right: râles to sixth rib and in entire back. Consolidation of upper lobe. Left: râles and impaired note to fourth rib and to angle of scapula.

June 2 to June 20, 130 cc. of serum.

July 6 to July 25, 105 cc. of serum.

July 6. Temperature to 100.2° F. Weight, 124 lbs. No change in cough or strength.

August 11. Physical signs have increased in both lungs. Has since not done well.

Summary.—Advanced case. No improvement in symptoms. Fever not reduced. Lungs much worse. Received 235 cc of serum over seven weeks.

CASE XVIII.—A moderately advanced case which received 125 cc. of serum. This patient is not included in the series, because she died of an intervening acute lymphatic leukemia.

CASE XIX.—No. 1721. J. O., male, age 16, admitted June 15, 1907. Sputum positive. Duration six months.

August 26. Temperature, 100° F. Weight, 79 lbs. Bad cough and expectoration. Night sweats. Poor appetite.

Lungs.—Right: infiltration at apex and base. Left: consolidation over upper lobe. Rest of lung infiltrated.

August 26 to October 1, 200 cc. of serum. No change in signs or symptoms. Patient is now much worse. Large cavity in left lung.

CASE XX.—No. 1542. M. W., female, age 35, admitted March 27, 1907. Sputum positive. Temperature, 100.4° F. Weight, 111 lbs.

February 13, 1908. Has been treated with tuberculin and had attained the weight of 129 pounds. Now weighs 122, has a very bad cough and a temperature of 100° F.

February 13 to March 1, 140 cc. of serum. Cough much better.

May 29. Has had much worry. Cough now very bad. Temperature, 101° F.

May 29 to June 18, 195 cc. of serum. Cough much better. Signs unchanged. Has since grown worse and is not doing well.

Summary.—Advanced case. Received 335 cc. of serum. Cough was much decreased during treatment.

THE EMPLOYMENT OF ARRESTED CASES.[1]

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The wonderful progress of the crusade against tuberculosis is unparalleled. Although it is hard for those of us who are directly interested in the work, and who know how much is yet to be done, to realize how much is already accomplished, still, when the progress is measured with that of other great movements, the contrast is most encouraging.

It is most wonderful that with the rapid growth of the work so few false steps have been made. Starting with the epoch-making discovery of Robert Koch, it has progressed steadily with few, if any, backward steps, until now, before even a generation has passed, it may safely be said that the end of the greatest scourge of civilization is within sight.

Granting that tuberculosis may never be completely eradicated, no one can deny that with the elaboration and strengthening of the means at hand it can be made a negligible quantity, in the causation of human misery and suffering.

The very size of the work is an advantage, for calling, as it does, for the most widespread reforms, it will result in a general uplift of humanity.

It would be well, in studying the question of what to do with the discharged cases, to learn what form of employment is followed by them after leaving institutions. In the great majority of cases the men of the poorer classes change their employment, but this change is not often of any material benefit because the hours are so long and the wages so small that disadvantages of environment are scarcely modified. Positions as street car conductors or motormen, collectors and drivers are being constantly filled by consumptives, and while possibly in many instances life is prolonged, the foregoing causes usually finally result in a reappearance of the disease.

So keen is the competition in the highly organized life of our large cities, and so inimical to health are the homes of the poor, that it is natural that failure is so often the result of the unaided effort of the consumptive to take up the burdens of life anew.

There are two movements taking place in most cities; one, that of the well-to-do toward more commodious and healthy homes in the suburbs, and the other that of the poor toward crowded tenement districts. This latter unfortunate movement is being met by many suggestions, and in some instances by more or less effective measures of relief. The educational work of nurses and charity workers, while palliative, is ineffectual toward removing the cause, and it is only through philanthropic work in building better tenements and municipal reform in better building laws, that material and rapid progress can be made.

Another agency, and the one which is most closely associated with the subject in hand, is the effort to create a movement toward the land.

Many efforts are being made to create a movement of the poor generally toward the country, but the great difficulties in the way render the success of these efforts doubtful. The lack of adequate funds, the ignorance and prejudice of the people themselves, and their lack of training in farm work, and the unpleasant aspects of country life, all tend to retard progress.

[1] Paper read at a meeting of "The Lænnec," a Society for the Study of Tuberculosis, Johns Hopkins Hospital, March 22, 1909.

The point is that the proper handling of tubereulosis will do much to eliminate the difficulties of this work.

It is in this connection that possibly the greatest amount of discussion is going on. Not only does the enforced negleet of bread winning on the part of the consumptive during his treatment in the home or institution throw a heavy burden on others, but his return to less remunerative employment, with the uncertainty of being able to keep it up, is very demoralizing.

While the home treatment of consumptives has many advantages, its action is just as limited as that of the average sanatorium. It calls for an intelligent patient who will follow the directions of the dispensary physician with little supervision, and what is more important, it calls for the assumption of the burden of his support, as well as that of his family, during his enforced idleness, and finally it calls for the readjustment of employment on his discharge. In the great majority of cases it is impossible for him to take up his old work, with all the drawbacks whieh have eaused his breakdown, and it is also impossible to so ameliorate the conditions as to insure his well being. And, as has been said before, the less laborious and trying occupations are so crowded that the lower remuneration will throw him into home surroundings which are impossible.

No doubt the tendency to improvement in living and working conditions is responsible for the reduetion in the mortality from tuberculosis, but we should not wait for this reform, and it is obvious that the individuals dealt with, the hopeless, disease-wrecked consumptives, are the hardest to handle.

Not only are the earlier cases with a ehance of complete arrest to be considered, but also the more advanced or so-called hopeless eases present a most serious problem. It has long been recognized that favorable environment will often prolong their lives in semi-invalidism for many years. If they are taken from their homes and patched up, only to be returned to the old surroundings, the work has to be repeated over and over again.

I have deemed it advisable to discuss these phases of the problem in order to convinee you of the neeessity of the adoption of further means in the struggle.

I believe that there is a gregarious instinct in us all whieh, though it may be very dormant, is still eapable of development under proper eonditions.

It may be impossible to take the average unintelligent man direct from the city and put him unaided in the country and expect him either to succeed or be satisfied, but this eondition does not apply to the consumptive. He has been compelled to give up his old conditions of life, and is bound to acknowledge that under those conditions life has been a failure. He is then in a most receptive state for advice as to a change. He knows, or will later learn, the great difficulty of any rearrangement of duties in city life whieh will assure his eontinued health.

Following out this line of argument a number of forees have latterly been at work developing it praetically. While lack of funds and appreeiation tend to make its progress slow, there is an ever-inereasing interest being shown.

In Germany there are land colonies where patients are given small plots for eultivation; in England there are several institutions where work in the soil is required, and in this country there are several already at work. While the work is undeveloped and limited, yet its success is, I believe, assured.

In many institutions basket making, art work, and various erafts have been taken up more with the idea of their therapeutic value than from the point of furnishing permanent employment after discharge. It is obvious that sueh fields are not large enough for handling the greater number of patients.

On the side of agriculture, however, the field is unlimited and the demand is constantly growing. The rapidly growing industrial eenters are constantly calling for an increased development of trucking and market gardening. Abroad, particularly in China and Japan and France, these industries have been carried to a high state of development and are very remunerative. In many eases an entire family is able to gain a living from one acre of land. The work is not laborious, and carried on as it is in the open air, is very healthful. In addition it is extremely interesting and develops skill and intelligence to as great a degree as any of the industrial trades. Two most interesting books in this connection are "Three Acres and Liberty," by Bolton Hall, and "The French Garden," by C. D. McKay, F. R. H. S.

In these books, in detail, are set forth the methods pursued in bringing land to its highest point of productivity. If one is not familiar with the eondition surrounding the trucking and gardening industries, it would seem amazing that greater development has not taken place. The average gardeners near our great cities are not men of any education, and they have been content to apply the same prineiples to their work that their fathers did before them. Agriculture, as a science, has not been recognized outside the agricultural colleges, and these colleges have been poorly patronized. In the last few years, however, these eonditions have been changing, and in the Middle West particularly, thousands of farmers and gardeners have been taking courses in these eolleges. This awakening is bound to bring about an improvement of conditions of living and employment in this industry, and if the forces in the tubereulosis crusade seize the opportunity mueh may be made of it.

In addition to this movement there is a constantly increasing demand for improvement in the milk supply. The milk furnished our large cities has been, and is to-day, a great source of infection, and while the conditions have been improved the work is really only begun.

I have tried to make plain that it is essential for the consumptive to modify his old environment, which, as a rule, has led to his downfall; that, as the work is now carried on, he is usually left to his own devices in making the ehange; and that it is becoming harder and harder for him to find a new work and a new home unassisted and untrained. It is

for this reason that the discussion of farm colonies has assumed such a prominent part in the deliberations of those interested in the work.

Arrested cases may be considered under two general heads; those who eventually may be cured and those in whom the disease will either slowly advance or remain quiescent under most favorable conditions. It is out of the question to keep the first class in a sanatorium until a real cure is completed, and it is also useless to send them back to the same environment. In the farm colony, however, where they may be made self-supporting, their stay may be prolonged until they are sufficiently trained to take up similar work independently, or until their cure is so complete that they may safely battle against their old environment.

For the second class permanent residence in the farm colony is essential. If, after treatment in a hospital, these cases are sent home the almost invariable rule is relaxed, which means either a return to the hospital for another term of expensive treatment or the re-establishment in the home of a center of infection. In a farm colony, however, owing to the endless variety of the work, suitable employment can be found which, to almost the same degree as with the earlier cases, will render them self-supporting.

Granting that such colonies are essential, their location and management are to be considered.

There are two essential points as to location; first, that the land is of such a nature as to be capable of being brought to a high state of productivity, and second, that it be situated close to some large center of population, with adequate and cheap means of transportation. Fortunately, there remain near our large cities many such tracts which may still be bought at a very reasonable figure.

Wherever possible the sanatorium and hospital for advanced cases should be located on the colony property, for while they in all essential points should be made separate and distinct, they can be under the same general management and can draw a large part of their food supply from the farm. This arrangement will also admit of a free and convenient interchange of patients. The farm colony will draw its inmates from the sanatorium and hospital, and in some instances where relapse takes place, the return of the patient for further treatment will be necessary.

In fact the success of the work will be more certain if at first it is only attempted to furnish the two institutions with supplies.

As it takes several years to properly develop the productivity of land, the progress must necessarily be gradual, and this is fortunate, for it gives opportunity for careful planning and false steps are less liable to occur.

The necessary buildings can be erected at a low cost. The quarters for the workers may at first be of the shack type, grouped about a central building containing dining room, kitchen and staff quarters. Later on small cottages should be built where tubercuIous families may be quartered. Most necessary is a large barn and stable where the farm products may be stored, and where the stock may be kept. Suitable provisions for hogs and poultry may also be made.

The staff should consist of a superintendent, one or more foremen, and matron and housekeeper. At first medical supervision can be carried on from the sanatorium, but as the number of inmates increases there should be a resident medical officer.

The farm superintendent should, if possible, have had tuberculosis, as it is only by practical experience that a man can be fitted to handle these cases. At first it will probably be impossible to find such a man, as he must also be a competent farmer. As the work develops, however, such a man may be trained. The foremen should be chosen from the most industrious and intelligent of the inmates. Different kinds of work must be carried on simultaneously in different places, and each group should be in charge of a leader.

The general bookkeeping, payment of wages, receiving and assigning of supplies, can best be carried on at the sanatorium.

There is a widespread idea that there is no work going on on a farm during the winter months. This is a great mistake. While it is true that planting and harvest times are the busiest of the year, there is plenty of work at all times. The variety of work in such a colony would be greater than in any other industry. Almost all the trades can find employment. Blacksmiths, carpenters, masons or bricklayers are constantly needed, and if their work is carried on under medical supervision it can be done safely by former patients.

The antebellum plantations possibly furnish the best examples of what can be done in this connection. Many of them contained several hundred slaves with their families, and nearly all of the more intelligent were trained in the special trades, so that each plantation was a self-sufficient community in itself. It is also worthy of note that under these conditions consumption was unknown among the negroes.

Aside from these special trades work on the farm and in the garden affords an endless variety of employment. With the exception of plowing, digging, and heavy lifting, there is nothing laborious about the work, especially about gardening. It is true that the exercise of unused muscles is at first tiresome, but if care is used undue fatigue can be avoided. The success met with by children's gardens in the vacant lots of some of our cities demonstrates the truth of this. The nature of the work also admits of an arrangement of hours to suit each individual case or group of cases. Planting, transplanting, weeding, cultivating, watering, raking, various forms of harvesting, care of stock, etc., afford occupation during the greater part of the year, while during the winter months repairs, hauling and sawing of wood, hauling of other kinds, and preparation for the more active periods take up all the time.

The problem of the care of women is not hard to solve in such a colony. The housework, cooking, care of poultry, laundry, mending and sewing, all carried on under hygienic conditions, afford them employment. If the proper morale is maintained many of them will take up light gardening, flower raising, etc.

When more than one member of the family is tubercular, as is usually the case, the problem of properly caring for them is always greatly magnified. Their removal from their homes not only entails expense for their care, and of the members of the family who are not breadwinners, but their return usually means the infection of those as yet free from the disease.

If cottages for such families be built the family relations may be maintained without the demoralization and expense attending the separation of children from their parents, and at the same time the health of these children can be assured.

It is an established fact that three or four people can be maintained on an acre of land.

Undoubtedly the prime requisites for the success of any such scheme are the application of up-to-date scientific methods of agriculture, the best possible business methods and the most conscientious supervision of the inmates.

As has been said before, scientific methods are only beginning to be applied to agriculture. The oldest of the arts of man is the least developed. Yields of from $1000 to $2000 to the acre are not only possible, but are becoming the rule under the most favorable conditions. Small fruit, asparagus, tomatoes, and early vegetables raised under glass pay very large profits. And the demand is so universal that they must continue to do so.

In no other situation is good business management needed more. The endless detail and great amount of planning needed make it essential, and without the sympathetic, careful supervision of the workers, although the other requisites are present, the plan must fail.

The point may be raised that great danger attends the handling of any food products by consumptives. If this were true, it could certainly be no worse than at present, when there is absolutely no supervision of these cases. It will always be essential that the final handling of food products be done only by arrested closed cases. This will not be hard to do, as the cases of open tuberculosis in such a colony would be few, as most of them would have lost their bacilli before leaving the hospital, and such cases as there are can be given employment where they can avoid any direct contact with food products. In addition, of course, there will be constant supervision and the utmost care in the disposal of sputum.

In opposition to any such schemes as these it is usually claimed that it is impossible to persuade the cases desired to be reached to leave the allurements of city life, and even if they are persuaded it is impossible to hold them. For the most, I believe that the unwillingness on the part of these people is due to their natural distrust of charitable organizations and philanthropists, to the necessary separation from their families, and to the supposed hardships and loneliness of country life.

Under the conditions I have outlined these objections are obviated. When the first change from the home to the sanatorium is made the rest is but a step, and the patient has opportunity to accustom himself to new conditions and to realize that his fears are groundless.

If he refuses at first to acquiesce to the plans, one relapse, after his return to his old environment, will be sufficient to convert him.

It cannot be denied that these cases must be cared for, and if this is admitted, then the farm colony presents the most feasible and economical means of care.

I have no doubt that my article so far may be criticised for being entirely theoretical, but I have chosen purposely to discuss the subject first in a general way before presenting any direct evidence as to its feasibility.

For the past three years we have been working along this line at Eudowood, and while we have been greatly hampered by lack of funds, I believe our results have justified everything I have said so far.

We first, by co-operation with the Phipps Dispensary, filled our sanatorium with incipient cases and applied, as far as possible, the system of graduated work so successfully employed by the Frinley Sanitarium in England and at White Haven in this country. We then had some 50 acres, but the soil was in a very depleted condition. With the aid of our patients and two healthy negroes, who did the heavy work, we commenced operations. During this year the expenses and profits about balanced. During the second year we built a large barn and stable and added a herd of cows. We added to our paid employees two former patients and continued to require work of all suitable cases in the sanatorium. One of the two cases we employed had been a molder and the other a potter. The former molder was reared in the city and knew nothing of country life. We put him in charge of the stable and cows, and his work has been eminently satisfactory. His wages at first were $12 a month, and he is now getting $20.

While the other man had lived in the country when a boy, most of his life had been spent in the city. He is intelligent and seems to possess a special aptitude for agriculture, and at the beginning of this year he was made farm superintendent.

During the second year the farm produced about $4000 worth of products at a cost of about $3400.

During the year just passed we established the farm colony as a separate institution. Through the generosity of one of our directors, Mr. Robert Garrett, we were enabled to secure a large farm adjoining our property at a low rental.

The buildings consist of a comfortable farm dwelling, a large barn and cow stable, horse stable, chicken houses, etc. There are about 100 acres of arable land which, with that on our own property, will give us 150 acres for cultivation. There are also about 100 acres of woodland and pasture. The location is ideal, the land is rolling and well drained, capable of being brought to a high state of productivity. The property is 500 feet above the sea, 7 miles from the center of the city, and $1\frac{1}{4}$ miles from the village of Towson. There are excellent transportation facilities and a ready market for any surplus we may produce. The farm buildings are about half a mile from the sanatorium.

Here, in the spring of last year, we established our little colony of ten men under the direction of a practical farmer.

Of these ten men four had been tailors, one a shoemaker, one a molder, one a potter, one a blacksmith, and one a school boy. Two were of native American stock, one of Russian-Jewish parentage, one Polish, one Roumanian, three Irish, and two German.

Five were apparent cures, four moderately advanced arrested cases, and one far-advanced arrested case. None of them had had tubercle bacilli in their sputum for some months previous. They were all enthusiastic over the experiment and were willing to take up the work on the promise that they would receive wages as soon as possible. As none of them had families dependent directly upon them, we felt justified in taking them on these terms. Only two, who had been working for some time previous, received wages. While we would have liked to have given them all some remuneration the scarcity of funds forbade it. Since the first of this year, however, we have been giving the men $10 a month, with the promise of further increase as soon as possible. Of the ten men all remained faithful except two. One secured a position on a neighboring farm and left with our full consent. Another left and joined the navy, but returned in about two months with some symptoms following a hemorrhage. After a period of rest in the sanatorium he was sent back to the farm, where he has since done well.

All of the cases have improved, and in spite of the fact that last year we could not pay them anything, and that we had a hard time finding clothing and shoes for them, they have been remarkably faithful and contented.

While the farm superintendent was a good farmer, he was lacking in executive ability, and was not able to get on well with the men. At the beginning of this year he left, and one of the men of whom I have spoken above, a former potter, was put in his place. This man had been working on the farm for two years and had been studying every book on agriculture he could get. The work is progressing most satisfactorily under his charge, and he has the confidence of the men.

Last year we raised about $6000 worth of farm products at a cost of about $5000. Much has had to be done which will not show immediately, in the way of preparing the land for greater productivity. We set out last fall 500 fruit trees and a large area of berries. We furnished the sanatorium with all its vegetables and milk, and sold a large surplus of vegetables. Four hundred gallons of tomatoes and a large amount of fruit were put up for winter use.

The cooking is done by a former patient whose husband is a patient in the hospital for advanced cases. One of her children is a patient in the sanatorium. We expect shortly to send the husband to the colony. This family had been a burden to the charity organization for three years. While they were willing to work, their physical condition was such that nothing suitable could be found.

We have another family which we expect to take as soon as room can be made. The father has incipient tuberculosis and was a former patient at the sanatorium. He has returned to his old home, but is not doing well at inside work. The mother is an old chronic case and is compelled to do the housework; one child is a patient in the sanatorium and another is on the waiting list.

There is no question that when we have brought the mother to the hospital and put the man to work on the farm that one focus of infection will be destroyed, and at the lowest possible cost.

It is said of a good many successful results achieved in different lines that they are due to personality. This is certainly not true of our work. The former farm superintendent had a very unfortunate personality, and I have often heard my own criticised. The work is successful because it is organized on rational business principles, and because it is the most simple and practical solution of the problem.

I want to say one word in regard to our patients. They are not of the highest order of intelligence, and were not specially selected, but they are ordinary human beings and can be handled just as well by any employer. They are not being pauperized.

I have endeavored to bring out the following points:

Agriculture presents the best form of exercise for tuberculous cases from a therapeutic as well as an economic standpoint.

The farm colony is not only the best possible means for the after-care of consumptives, but also, as it develops, will be the best agent for encouraging the much-wished-for movement toward the land.

These colonies, if properly located and managed, can be made self-supporting.

They present the only way for handling tuberculous families.

They should be located in close conjunction with a sanatorium and a hospital for advanced cases, and should also be near large centers of population.

No work should be undertaken without endeavoring to keep the entire program in sight.

It is not claimed that the farm colony will solve the tuberculosis problem, but that it is essential to have it in cooperation with all the other necessary forces.

I have endeavored to establish two points; first, that the colony is necessary and practical, and, second, that it can be made self-supporting.

If we have succeeded in our modest experiment, unaided by past experience and retarded by lack of funds, there is every assurance for success where ample funds are at hand.

I trust I may be pardoned for presenting this dry sociological paper at this meeting, but I believe that such subjects concern the doctor almost as much as medicine does, certainly in connection with tuberculosis. Perhaps few of my hearers will ever achieve much in the laboratory struggle against tuberculosis, but every physician, if he will do all in his power to help those directly engaged in the fight, with the every-day methods at hand, can do much.

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ON THE RELATION OF THE ISLANDS OF LANGERHANS TO GLYCOSURIA.

By W. G. MacCallum, M. D.,
Professor of Pathological Physiology, Johns Hopkins University, Baltimore.

(From the Hunterian Laboratory.)

In their earlier papers upon diabetes mellitus, Opie and others showed that in all probability the islands of Langerhans are of paramount importance in maintaining the normal carbohydrate metabolism, and that in certain cases of diabetes with intense glycosuria the lesion may apparently consist in their being destroyed while the rest of the pancreas is intact. The fact is, however, recognized that there are many cases of diabetes in which this specific lesion does not occur, and there are many who hold that it is far from proven that the islands of Langerhans have any such special function, and that diabetes is rather the result of injury to the whole tissue of the pancreas. This whole question has been ably reviewed by Sauerbeck,[1] to whose paper the reader may be referred. It is of course desirable that we should know precisely the function of these islands of tissue, and many experiments have been devised to throw light upon the subject, but the difficulties are such that as yet the evidence is not conclusive. They are so small and numerous and so widely scattered throughout the tissue of the pancreas that there is no question of separating them mechanically and investigating their activities, as has been done with the other so-called organs of internal secretion.

It is known, however, that if the ducts of the pancreas be ligated so that the secretion of that gland is obstructed from passing into the intestine, there follow certain digestive disturbances and injuries to the gland, but there is no disturbance of carbohydrate metabolism and no glycosuria. Indeed, even though the animal live for some time so that a marked scarring and atrophy of the obstructed gland is produced,

[1] Sauerbeck, Lubarsch and Ostertag: Ergebnisse d. allg. Path. u. path. Anat., IX., 1.

there need be no glycosuria, although as Pratt has recently shown the assimilation limit for carbohydrates may be lowered. This is generally ascribed to the fact that although such obstruction to the ducts causes the atrophy of the secreting acini, the islands of Langerhans, not being connected with the ducts, do not suffer, and indeed are usually found intact in the scar tissue which replaces the gland. A similar explanation for the absence of glycosuria is most plausible in those experiments of Minkowski in which portions of the pancreas were transplanted or dislodged from their usual position and from all connection with the duct, the remainder being then removed.

Such experiments seem to promise a satisfactory solution of the question if it is true that by such means the secreting tissue of the pancreas can be made to atrophy completely; for then if the islands of Langerhans really remain intact, they might finally be secured in a pure state so that their specific function could be studied.

The following experiment, which was planned from this point of view, will be given for what it is worth, although it will be seen that even under the most favorable conditions a perfectly clean-cut result can hardly be expected. In most respects it resembles the experiments of Minkowski or those in which the whole pancreas is ligated and separated from the intestine.

It seemed that the chief objection to the latter mode of conducting the experiment lay in the fact that if atrophy of the secreting portion of the gland were to be complete, the dog must be kept in good condition for a very long time after the ligation of the duct, which must be difficult or impossible if the whole pancreas is thrown out of connection with the intestine. For this reason the dog was left with half of the pancreas, or rather more, in the normal condition, while the remainder was separated after ligating its duct and allowed to atrophy. It was proposed to allow the dog to live for a long time in this condition and then study the function of this atrophied portion, which should then consist presumably of islands of Langerhans only.

The protocol of the experiment was briefly as follows:

Dog 76, 1908. Stout, brown and black male.

October 8, 1908. One of the two branches of the pancreas, constituting rather more than one-third of the whole gland, was separated from the rest by the passage of two ligatures about the gland, which was cut through between them. These ligatures of black silk were intended to act as landmarks later. The ligated portion lying in the mesentery was pushed back and the omentum tucked about it. The head of the gland was applied to the intestine and the other branch remained untouched.

The dog recovered perfectly from this operation and was quite well all winter, with absolutely no signs of pancreatic insufficiency.

May 9, 1909. Fehling's test for sugar in the urine, negative.

May 10, 1909. Second operation, in which the isolated portion of the pancreas was brought to view. It was easily found by the aid of the black ligatures, but would otherwise have escaped notice, for nothing remained except the faintest opalescence in the mesentery, with the most inconspicuous points of thickening here and there. This area was, however, pretty well outlined by the abundant and peculiarly arranged blood vessels, which formed the most conspicuous feature.

The remainder of the pancreas was quite normal in appearance, and the proximal black silk ligature was found on its stump opposite the atrophied area. This whole mass was extirpated, the vascular supply to the intestine being carefully freed from the head of the pancreas in which it lies embedded. This was done in such a way that one could be quite sure that no vestige of the pancreas remained except the atrophied isolated portion described.

Urine secreted just before the operation showed no sugar, nor did that secreted during the remainder of the day.

May 11. Urine collected during the morning of this day showed no sugar on being tested with Fehling's solution, but on the next day, May 12, the urine contained a considerable quantity of sugar and gave an abundant precipitate with Fehling's solution. This sugar was unfortunately not estimated, but it continued during the next day, May 13, diminishing greatly on May 14. After this, as will be seen from the chart, there was practically no glycosuria, although on some days an inestimably small quantity was excreted, and on May 21 and 22 it was possible to estimate the quantity (0.53 and 0.26 gm.). On these days sugar was found only in the relatively concentrated urine secreted during the night, and not at all in the more dilute urine which was secreted after the daily ration of 500 gm. of water. After this up to May 30 the urine was quite free of sugar, although dextrose was administered in increasing doses to determine the dog's assimilation limit. At first for several days, May 21-22, no food was given, then 5 gm. dextrose on May 23, and 10 gm. on May 24. After that the diet of beef (200 gm.) was resumed, together with the dextrose, which was increased to 20 gm. It was not until 40 gm. of dextrose was given at one dose with the 200 gm. of beef and 500 cc. of water that any glycosuria appeared.

In the urine secreted during the next eight hours there was excreted 1.496 gm. of sugar, while that secreted at the end of the eight hours was absolutely free from sugar. Evidently, therefore, this dog with his atrophied remnant of pancreas could assimilate 38.504 gm. of dextrose when taken at one dose. After this the diet consisted of 200 gm. beef and 500 cc. water, and there was no glycosuria.

On June 1, two days after the excessive dose of dextrose, a third operation was carried out. The dog was fed as usual in the morning and given 500 cc. of water. At 3 p. m., after he had secreted 400 cc. of sugar-free urine, the abdomen was opened under ether anæsthesia, which lasted an hour and 25 minutes. Abundant omental adhesions had formed round the site of the last operation and enclosing the pancreatic remnant, so that its extirpation was not as simple as expected. It was finally plainly outlined, however, and seemed to have grown noticeably thicker than it had been at the last operation. Distinct, though minute, nodular masses could now be seen, richly supplied with blood vessels. A triangular piece of mesentery was excised so as to remove all of this mass, giving it a wide berth. The tissue itself was fixed in formalin for microscopical study. At 8.30 p. m. the dog had secreted 85 cc. of urine rich in sugar, the whole amount containing 0.5720 gm. of sugar. The 125 cc. secreted during the night was much richer, containing more than 6 gm. of sugar.

This intense glycosuria persisted through the next three days, the dog excreting (as seen in the chart) 23.32, 15.95, 5.104 gm. respectively on these days. It is notable that the amount of sugar excreted thus sank rapidly during the days following the operation, and it would have been wise to observe the dog without further intervention for as long as possible, because the question arises as to the part played by the ether anæsthesia in this rather transient glycosuria. All this had not been thought out at the time, however, and it had been planned to study the effect of thyroidectomy upon this depancreatized dog.

Accordingly, on June 5 the dog was again etherized for about 45

minutes and both lobes of the thyroid removed, the two larger parathyroids being left in situ. After this and for the next three days, that is, up to the animal's death, there was no trace of sugar in the urine. It is unlikely, therefore, that the previous etherization was important in producing the glycosuria, since the anæsthesia at the last operation had no such effect.

I can, however, offer no good explanation for the complete disappearance of the glycosuria after the thyroidectomy. It is true that in this dog, accustomed as he was for a long time to a relative insufficiency of the pancreas, the glycosuria after the complete extirpation of the pancreas was rapidly diminishing, and it would have been very desirable to know whether without the thyroidectomy it would have disappeared completely.

This suggests the possibility that if pancreatic insufficiency be slowly enough produced some other organ may supply the alimentary glycosuria. But for the glycosuria following extirpation of the pancreas the experiments quoted by Eppinger, Falta, and Rudinger show a diminution, but not a complete disappearance, after thyroidectomy. I have carried out one experiment in this connection which agrees with their results as contrasted with those of Lorand, who caused complete cessation of the glycosuria following pancreatectomy by thyroidectomy.

The experiment was briefly as follows:

Dog 79, 1909. June 10. Whole pancreas extirpated. Urine normal.

June 11. Urine contains 12 gm. sugar.

June 12. Urine contains 32.68 gm. sugar. Both thyroids extirpated at noon, parathyroids left.

June 13. Urine contains 16.58 gm. sugar. Dog died at end of this day.

Date.	Operation.	Diet.	Water.	Amount urine.	Fæces.	Sugar.	Total N.	$\frac{D}{IV}$ ratio.	NH_3N.	Weight.
May 10	Extirp. of intact portion of panereas.	General.		300 gr.						
" 11										
" 12						Abundant.				
" 13						Abundant.				
" 14						Less.				
" 17						Minimal.				
" 18						Normal.				
" 19				Small.	Voluminous, pale.	Minimal.				
" 20		200 gr. meat.	500 gr.		Abundant.	None.				
" 21		0	500	240	Fatty stools.	0.53 gr.				
" 22		0	500	735	Fatty.	0.264 gr. (only in eone. urine).				20¼ lbs.
" 23		5 gr. dextrose.	500	435		0				
" 24		10 gr. dextrose.	500	465		0				
" 25		10 gr. dextrose, 200 gr. beef.	500	515	0	0				
" 26		20 gr. dextrose, 200 gr. beef.	500	490	Abundant undigested meat.	0				
" 27		200 gr. beef.	500	602		0				
" 28					Nearly normal.	0				
" 29		40 gr. dextrose, 200 gr. beef.	500	285		0				19¼ lbs.
" 30		200 gr. beef.	500	630		14.96 gr.	7.88 gr.	1.9 gr.		
" 31		200 gr. beef.	500	175 (some lost)	Little.	0				
June 1	2d operation, extirpation of islands.	200 gr. beef.	500	575		0	5.31		0.46308 gr.	18¾ lbs.
" 2		200 gr. beef.	500	610		6.860 gr.	6.58	1.04	0.2728	
" 3		200 gr. beef.	500	636		23.32 gr.	7.60	3.06	0.77308	
" 4		200 gr. beef.	500	725		15.95 gr.	10.55	1.5	0.64706	17½ lbs.
" 5	Thyroidectomy.	200 gr. beef.	500	755		5.104 gr.	7.04	0.7	0.68667	
" 6		200 gr. beef.	500	530		0	7.42		0.39193	16½ lbs.
" 7		200 gr. beef.	500	528		0	10.02		0.493	
" 8, died			300	432		0	3.65		1.831	

function and maintain carbohydrate metabolism. An analogous instance seems to have been furnished by the dog operated upon by Dr. Halsted in which, after complete extirpation of the parathyroids, a parathyroid was transplanted, and the dog was kept alive by a microscopic fragment of this tissue for a year. After the extirpation of this infinitesimal mass he lived for weeks and was finally killed. The most minute search failed to reveal any more parathyroid tissue. One received the impression that after all the action of these glands is not absolutely specific, and that possibly their function may be assumed at need by others.

As to the part played by the thyroidectomy, the following may be said: It is known, as Eppinger, Falta, and Rudinger have pointed out, that extirpation of the thyroid gland decreases glycosuria produced by adrenalin when the pancreas is intact. Grey and de Sautelle have proven the same thing for the glycosuria following ether anæsthesia, and McCurdy for

Here there was a diminution in the glycosuria, but no such complete disappearance as in the dog the subject of our first experiment.

Whether the thyroidectomy influenced it or not, it remains to be explained why there should be such a complete cessation of glycosuria in a dog entirely deprived of his pancreas. Of course a cessation of glycosuria occurs in diabetics on the advent of an infectious or inflammatory process and under other circumstances before death, but in those cases too the explanation is obscure.

New difficulties arise when we come to the microscopical study of the atrophied portion of the pancreas removed at the third operation, for it is not easy to say with certainty whether the curious tissue found there is composed only of island of Langerhans cells or partly of distorted and shrunken panereatic cells. A priori it would seem impossible that there should be an absolutely complete disappearance of the pancreatic tissue,

and the persistence of abundant ducts serves to make this more evident. The tissue consists of numerous minute strands and masses abundantly supplied with blood vessels and lying in the loose fibrous tissue of the mesentery. There is only one type of cell aside from those definitely forming the walls of the persistent ducts. These cells are arranged in long strands or very commonly in balls or acinus-like masses, or are quite irregularly strung together. The outline of each group is very irregular, but the groups are far larger than any normal island of Langerhans. In the places where the cells are grouped in acinus-like balls and where there are ducts scattered among them, it is hard to avoid the idea that they are remnants of pancreatic tissue. Elsewhere, however, where the same cells are arranged irregularly or in strands, this impression is not received. In no particular, however, do the cells themselves resemble the normal pancreatic cells. Instead of a protoplasm filled with granules we have a ragged, vacuolated, unstained protoplasm. Instead of a nucleus with definite red-staining nucleolus, as is found in the pancreatic cells, we have one in which no nucleolus shows. On the other hand these peculiarities are exactly those of the cells of the islands of Langerhans, and in every particular the cells are identical morphologically with those constituting the normal islands. The normal islands of Langerhans in the dog are not sharply outlined, and their cells are often clumped together into small acinus-like balls.

On the whole, although such difficulties exist, it seems to me that the evidence is such as to show that we are almost certainly dealing here with very much enlarged and coalescent islands of Langerhans, although there are interspersed remnants of the atrophied pancreas in the form of ducts and possibly also of acini, so shrunken as to be no longer recognizable or functional. Here again further studies to show the course of the anatomical changes in the dog's pancreas after ligation should be carried out.

Nor was the result of the operation for the extirpation of the pancreas an absolutely clean one, for at the autopsy there were found about the duodenum two minute fragments of pancreatic tissue in a good state of preservation and evidently undergoing hypertrophy. The larger of these was about 3 mm. in diameter, and had apparently reformed itself about the stump of the duct. The other much smaller fragment had grown in the substance of the wall of the intestine so as to have been quite inaccessible at the time of the operation. This minute fragment, too, sent duct-like structures into the intestinal mucosa, but such infinitesimal portions of a large organ like the pancreas seem hardly sufficient to obscure the results of the experiment. Indeed they were discovered only by microscopical examination. It would be necessary, however, in order to prevent such an occurrence, to resect the portion of the intestine with which the pancreas comes into relation.

The study of the nitrogen output gave no striking result, unless it be in the terminal increase of the ammonia in the urine, which was accompanied by an excretion of diacetic acid.

The condition of the stools is, however, of interest, for although for a time after the extirpation of the secreting portion of the pancreas they became very voluminous and on certain days consisted almost entirely of fat, they later became quite normal in appearance. During the whole of the last two weeks of the animal's life the food consisted of beefsteak which contained a good deal of fat; but although there were sometimes evidences of incomplete digestion of the beef, the stools did not again assume the vaseline-like consistency which they showed a short time after the extirpation of the pancreas. One receives the impression that here too a compensatory process in brought about, through which the fat-splitting action of the pancreatic juice is gradually replaced by a similar ferment produced elsewhere, probably in the intestine itself.

All of these results lead one to pause before accepting as complete the results of experiments upon these chemical processes which have lasted over only a few days. Whatever be the specificity of the action of certain organs in the normal state of the body when there is a satisfactory response on all sides to the division of labor, it may well be that when one of these organs is disabled or destroyed others can, *if time be allowed,* take up its functions more or less satisfactorily.

RÉSUMÉ.

When a portion of the pancreas is separated from the rest and its duct ligated, it undergoes extensive atrophy, a tissue remaining which is apparently composed of enlarged islands of Langerhans and the remnants of pancreatic ducts.

If the rest of the pancreas be removed, this atrophied remnant is capable of warding off glycosuria even when considerable amounts of dextrose are ingested. When it itself is removed also, glycosuria appears at once spontaneously. Whether the glycosuria would persist until the death of the animal remains to be determined, but this experiment suggests the possibility that there may be some compensation on the part of other organs, both with regard to glycosuria and the faulty assimilation of fat after the loss of the pancreas. The experiment in so far as it was successful was intended as a demonstration of the specific control of carbohydrate metabolism by the islands of Langerhans.

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TUBERCULOSIS OF THE PARATHYROID GLAND AND ITS RELATION TO THE OCCURRENCE OF TETANY IN TUBERCULOUS MENINGITIS.

By M. C. WINTERNITZ, M. D.,
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During the past year two patients suffering with tetany as a terminal complication of acute miliary tuberculosis have come to autopsy at the Johns Hopkins Hospital. It is known that such symptoms may occur in tuberculous meningitis, and in fact it seems that tetany may occur in tuberculosis even where meningitis can be excluded. With the recent development of our knowledge concerning the function of the parathyroid glands, it is not unnatural that observers should search for lesions in these organs to explain if possible the convulsions.

Within the past few years Carnot and Delion have reported a case of tetany occurring in general tuberculosis, where meningitis could be excluded at autopsy. In their case only one parathyroid gland was diseased, but they were inclined to ascribe the tetany to that lesion. Since their article appeared four other cases have been recorded, one by Benjamin, two by Verebély, and one by Eggers. In all of these cases there were definite though slight tuberculous lesions involving one parathyroid gland. In all of the cases there was a generalized tuberculosis, but in none of them had any symptoms of tetany been observed. These authors, especially Eggers, take exception to the explanation offered by Carnot and Delion concerning the relation of the parathyroid lesion to the occurrence of tetany. They do not think the involvement of one gland sufficient to account for the tetany, since the individual still had at least two normal glandules remaining.

It is with the hope of throwing some light upon the occurrence of tetany in tuberculosis with or without the involvement of the parathyroid glands that the following two cases are reported:

CASE I.—M. L., colored female, age 21 years, was admitted to the medical clinic of the Johns Hopkins Hospital at midnight on the 9th of July. No history could be obtained, as the patient was in deep coma from which it was impossible to arouse her. There was a conjugate deviation of the eyes to the right; the right arm and hand were flexed on the chest, but were not spastic. The hand was occasionally contracted, assuming the obstetrical position. The right thigh and knee were flexed, while the extremities of the left side were straight. Pressure over the lower end of the right upper arm produced typical tetanic contractions of the forearm and hand. These signs could be elicited to a less extent when pressure was made upon the left arm.

The examination of the lungs showed a limitation of movement of the right side. Here the vocal fremitus was increased and the percussion note was almost flat. The breath sounds were distant and tubular in quality over the entire right side. At the left apex there was likewise a slight impairment of the percussion note, and here the breath sounds were tubular, many fine râles being heard. The examination of the heart and abdomen revealed nothing of note.

During the night the patient became even more profoundly comatose. At frequent intervals there were general epileptiform convulsions lasting from one to two minutes. During the convulsions the respirations were shallow and the patient became cyanotic. There were fibrillary contractions of the tongue. In the forenoon the attacks continued at frequent intervals. Between them there was almost complete relaxation. At 2 a. m. and at 9 a. m. the patient received calcium lactate by the aid of the stomach tube, but this treatment did not seem to influence the convulsions. Her condition grew worse, and at noon 4 gm. of calcium lactate in 100 cc. salt solution were introduced into the arm vein. There were no further convulsions, but the patient's condition rapidly grew worse, and at 2 p. m. she died.

Autopsy (No. 3072), 3 p. m.

Anatomical Diagnosis.—Generalized tuberculosis; tuberculous bronchial lymphadenitis; tuberculous meningitis; acute tuberculous bronchopneumonia with cavity formation; chronic tuberculous pleuritis (bilateral); tuberculous pelvic peritonitis; chronic perihepatitis and perisplenitis; miliary tuberculosis of the liver; fatty degeneration of liver; chronic splenic tumor; ovarian cysts (bilateral); anæmia; emaciation.

Brain: The dura is closely attached to the pia arachnoid membranes over the convexity of the right hemisphere. There is a considerable amount of œdema in the pia arachnoid membranes. Both temporal lobes are closely bound down to the inferior portion of the parietal lobe by rather firm adhesions; when these are broken the surface between these two lobes is seen to be considerably roughened and of a pinkish gray color. Scattered over the surface one sees small, transparent nodules, most of which are quite small, pinhead in size. Along the vessels in this region numerous similar nodules can be made out. A similar granulation with small, opaque, grayish nodules is found over the base of the cerebellum and on both sides of the medulla. Even over the convexity of the brain one finds here and there small nodules. Numerous sections through the substance of the brain fail to reveal anything abnormal.

CASE II.—S. H., colored female, age 26 years, was admitted to the medical clinic of the Johns Hopkins Hospital, on February 7, 1909, complaining of headache. Her history was unimportant from the standpoint of her present illness. This began about three weeks prior to admission with headaches. These were accompanied by epistaxis.

Physical examination on admission: The patient was very restless, moving from side to side in bed; although rational in the morning, she did not answer questions or notice anything about her at 4 p. m. of the same day. There was a distinct exophthalmos and an internal strabismus. Passive flexion of the head was resisted, and the body could be raised with the hand under the occiput. The patient complained during the manipulations. The glands of the axillæ and of the neck were somewhat enlarged. Thorax was symmetrical. The heart and lungs revealed nothing of note. The abdomen was flat, and there was no tenderness, but a slight voluntary resistance. There was an atypical Kernig's sign present.

On the evening of February 7 the patient suddenly had a convulsion. This was general in character, involving the entire body. During the next hour she had six similar convulsions. The last two were observed and were described as follows: Long inspiratory cry followed by tonic convulsions, which first involved the muscles of the face and eyelids. The arms became involved, and the hands assumed the typical obstetrical position observed in tetany. The body was in opisthotonos, the head retracted and the back arched. The legs were much less involved than the arms. The patient had two slight convulsions on the morning of the 8th.

The rigidity of the back had increased markedly, and the patient's condition gradually grew worse, though there were no more convulsions. Fluid obtained by lumbar puncture on admission showed many mononuclear cells, and a few slightly beaded acid fast bacilli.

Autopsy (No. 3170), February 11, 3 p. m.

Anatomical Diagnosis.—Tuberculosis of the retroperitoneal and mesenteric lymph glands; tuberculosis of the thoracic duct; tuberculous endocarditis; general miliary tuberculosis; tuberculous meningitis; tuberculosis of lungs and pleura; miliary and conglomerate tubercles in the liver, spleen, and kidneys; anæmia; tuberculosis of the parathyroid.

Brain is rather dry. The surface is congested slightly, and one sees scattered over the convexity of the brain, even as far as the median line, numerous small, semi-transparent, grayish, opaque nodules, which are only 1 or 2 mm. in diameter. The Sylvian fissures are obliterated by rather firm adhesions, and when these are separated one finds a granulation tissue in this area. Along the blood vessels one can see numerous tubercle-like nodules. Over the base of the brain, especially the pons, there is an exudate which is firm. In this one can make out a few small nodules. The cerebellum does not show any of these tubercle-like nodules—nor does one see any on the base of the occipital lobe.

Parathyroids: Four parathyroids were found. They were somewhat enlarged, but this was not sufficient to be worthy of note. Serial sections were made of the glands, and a conglomerate tubercle, involving approximately the lower third of one of the glands, was found. This had a definite caseous center and was surrounded by a dense zone of epithelioid and mononuclear cells. Numerous typical giant cells were found in this zone. Otherwise the parathyroid glands seemed normal.

Briefly to summarize: Both patients were colored females, aged 21 and 26 years respectively. The illness was acute, and in both cases typical symptoms of tetany had been observed during life. At autopsy both showed general miliary tuberculosis. In one of the cases there was a small focus of tuberculosis in one parathyroid gland.

It is greatly to be regretted that the parathyroids were not carefully examined in the first case, but it is interesting to note that the convulsions immediately subsided following the injection of calcium into the arm vein.

It will be remembered that MacCallum and Voegtlin have recently shown that there is a very intimate connection between the calcium metabolism and the parathyroid glandules. They found an increase in the calcium output in the urine and feces with a diminution in the blood and brain of animals suffering with tetany. More important than this, however, they found that the symptoms of tetany could be entirely relieved by injection of calcium.

With this work in mind, it is quite natural that we should turn first of all to the mineral metabolism in tuberculosis for a possible explanation of the symptoms of tetany in this disease.

Interest in the calcium metabolism of phthisical individuals was aroused long ago, especially in France, by the work of Gläube, who showed that the calcium of the urine was increased in tuberculosis. Senator came to the same conclusions. These authors thought an excessive excretion of calcium occurred in incipient tuberculosis. But as Ott points out, these observations are only of limited value, since the above mentioned observers, like many others, did not take into consideration the mineral value of the ingested food nor the possible dissipation of these substances through the feces and sputum. Ott reports a number of cases of tuberculosis in which he analyzed both the ingested food and the excreta, including urine, feces and sputum. In his first series he includes five cases of outspoken pulmonary tuberculosis. In none of these was there a body loss of calcium, and in the majority there was a slight retention, which the author is inclined to ascribe to variations in the rapidity with which calcium is excreted. In his second series Ott includes three cases; in two of these his results were similar to those obtained in the first series. But in the third case, despite the fact that the individual was in nitrogenous equilibrium, there was a marked loss of mineral substances and of these the calcium was most prominent. The author concluded that demineralization in advanced tuberculosis must be conceded, but that this is not a constant finding.

Of course, these cases are by far too meagre to allow of any positive conclusions, but they are certainly inspiring for further work. It seems quite possible that in certain cases of tuberculosis there may be a marked disturbance in the calcium metabolism. This might be of sufficient extent alone to bring about a deficit in the calcium of the circulating fluids, and in this way cause an hyperexcitability of the nerve cells. This is at least a tempting hypothesis which would explain tetany in some cases of tuberculosis, where no lesion of the parathyroids is demonstrable. On the other hand, if there is already a deficit of calcium in the circulating fluids of the body, a slight injury to the parathyroids might very readily be of crucial importance and cause sufficient additional disturbance in the calcium metabolism to bring about tetany.

I wish to take this opportunity to thank Dr. L. F. Barker and Dr. W. S. Thayer, who so kindly allowed me the use of the medical histories.

Conclusions.

1. Tetany may occur in advanced tuberculosis.
2. This may be associated with tuberculosis of the parathyroid, but the lesions in these glandules in the cases so far reported are not extensive enough to account for the symptoms.
3. In some cases of advanced tuberculosis there is a disturbance in the calcium metabolism of the body, with namely an excessive excretion of this mineral.
4. This may in itself be sufficient to bring about a condition of hyperexcitability of the nerve cells, and the presence of even a slight lesion in the parathyroid glands may be sufficient to cause tetany.
5. Calcium salts should be used therapeutically in tetany complicating tuberculosis.

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THE USE OF ANIMAL MEMBRANE IN PRODUCING MOBILITY IN ANKYLOSED JOINTS.[1]

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The production of mobility in ankylosed joints—whatever the character of the ankylosis—is a problem which has interested surgeons, and particularly the orthopedic surgeon, for a long time. Formerly we were content to rid our patients of their diseases and to obtain a joint which was serviceable for the work put upon it. With our increased knowledge of bone pathology and with the light that the Roentgen ray has shed on affections of bones and joints, surgeons for the past ten years have attempted not only to cure the diseased part, but to restore the part so that it could perform as nearly as possible all its normal functions.

It is a common saying that "Necessity is the Mother of Invention." It might as truly be said that necessity is the mother of joint surgery which has for its object the production of mobility. Through this necessity the earliest work which was done along this line was the attempt to produce mobility in those cases of ankylosis of the joint where the metabolism of the body was greatly interfered with owing to that ankylosis.

In 1893 Helferich excised the condyle of the inferior maxillary bone in a child one year of age, and inserted an attenuated flap from the temporal muscle. This was repeated by Lentz, Henle, and others. Instead of a flap from the temporal muscle a flap from the masseter was used by Mikulicz in 1895. Both the coronoid process and the condyle of the inferior maxilla were removed and a flap of the temporal muscle inserted by Bilezguski and Hoffa, while Kusnetzow used a masseter flap in the same operation. The superior portion of the entire ramus was removed by Rochet and Schmidt, and a flap from the masseter was interposed. Gluck in 1902 used a skin flap in place of the muscle flap of earlier surgeons. Not only have flaps been used by various surgeons, but foreign materials have been inserted between the articular surfaces to produce motion in ankylosis of the joint. In 1901 Orlow inserted metal plates and also gold foil to relieve this condition. All of these operations have met with greater or less success.

Following closely upon the operations for ankylosis of the joint where nature demanded mobility to carry on the processes of life, surgeons began to operate upon other ankylosed joints, chiefly the knee, hip, and elbow, in which, while mobility was not a necessity, it was greatly to be desired.

The materials used between the articulating surfaces of a joint have been numerous. A muscle flap from a muscle contiguous to the joint has been preferred by most surgeons. The muscle flap was used by Quenn, Albarran, Nelaton, Delbet, Murphy, Hoffa, Schantz, and others in ankylosis of the elbow joint; Rochet, Nelaton, Hoffa, and others in ankylosis of the hip and leg, others in the knee. This has given a marked improvement in the hands of some men, while it has been unsatisfactory with others.

Murphy has urged the use of a flap of fascia covered with a good layer of fat, and reports some remarkable results. He concludes that the results depend upon the formation of a bursa. Chlumsky, disappointed with the results of muscle flaps, used non-absorbable materials of zinc, rubber, celluloid, silver, and layers of celloidin, but no permanent results were obtained. He substituted for the non-absorbable materials he had used absorbable plates of decalcified bone, ivory, and magnesium. These results, while better than those with non-absorbable materials, were not on the whole satisfactory. R. T. Weglowski, in the *Centralblatt für Chirurgie*, April 27, 1907, reports a case in which he transplanted the cartilage from the seventh rib into the ankylosed elbow joint, and obtained from 60 to 70 degrees of motion after five weeks.

There are certain reasons why the interposition of muscle or fascia or any non-absorbable material into a joint cannot form the ideal method for the production of mobility. The anatomical structure of the joint is often materially interfered with when any bulky substance sufficient to cover the entire joint, as a muscle, in interposed. It necessitates too large an excision of bone, and on the other hand if too little muscle or fat is interposed, ankylosis results. In a majority of cases the interposition of a living tissue is followed by a constant pain, due to pressure upon its nerve endings. While we may attain a certain degree of motion by the interposition of muscle or fascia, the motion is generally unnatural in character and quite often results in an unstable joint.

With these objections before me I undertook to find an absorbable material which was thin and pliable enough to allow of easy adjustment within the joint, and which would remain there beyond the period of new bone or fibrous formation. This is simply a preliminary report. The experimental study upon animals and the pathological changes which are formed with the use of the animal membrane in various types of inflammation, and further operative results, are now being carried on.

The membrane which I have used is from the pig's bladder, and chromicized so as to remain intact about 40 days. I am greatly indebted to Messrs. Johnson and Johnson, who have spent much time and labor in finding a membrane of the proper thickness and pliability, and chromicizing it to the proper degree.

Case 1.—L., white, male, age 21 years, was admitted to the hospital April 28, 1908.

The boy had an acute attack of gonorrheal arthritis in the knee. He was in bed for 8 weeks following this attack, and afterwards found that his knee was perfectly stiff in a position of flexion of 15 degrees. He was admitted to the hospital in the

[1] Read before the American Orthopedic Association, Hartford, Conn., June 15, 1909.

hope of producing motion in this ankylosed joint. The X-ray picture showed complete bony ankylosis between the patella and the femur and between the femur and tibia, with a new production of bone posterior to the condyle. An arthrotomy was performed April 28, 1908. Two lateral incisions were made along the sides of the patella, and the joint was found to be completely ankylosed by new bone formation. The patella was chiseled from the femur and also the tibia from the femur. After a great deal of difficulty complete mobility was obtained and the new bone formation was removed. All evidences of the cartilage had been obliterated and the synovial membrane also had disappeared. Cargile membrane was inserted into the joint so as to completely prevent contact of one raw surface with another, the membrane being sewed into the joint by means of catgut sutures. During the operation, in order to get the joint perfectly movable, the tibial tubercle was broken away from its attachment. The wound was closed entirely, the leg being put up in a cast; the tubercle was fixed in place. There was a rise of temperature for 3 days following the operation, but after that the temperature remained normal. On the 8th day the cast was removed and passive motions instituted. At the end of 30 days, however, the motion was only 10 degrees, and this has persisted for 13 months since the operation.

Synopsis: Boy aged 21 years. Gonorrheal arthritis. Duration one year. Complete bony ankylosis. Insertion of Cargile membrane. Motion of 10 degrees only, after 13 months.

Case 2.—B., white, female, age 50 years, was admitted to the hospital July 16, 1908.

The duration of her disease had been 1 year and 3 months. The left knee is swollen and absolutely rigid. The infectious process is apparently a septic one, coming from an infection of the tonsils. The X-ray picture shows bony ankylosis between the patella and femur and between the tibia and fibula. An arthrotomy was performed on July 16, 1908, lateral incisions being made on both sides of the knee. The bone was chiseled through beneath the patella and between the femur and tibia, and Cargile membrane was inserted between the ends of the bone and sewed in place by means of catgut sutures. There was a slight rise of temperature for 3 days following the operation, and then it subsided to normal. The leg was put up in a cast and dressed on the 10th day, when the wound had healed *per primam*. There were about 15 degrees of flexion at that dressing. Passive motions were instituted, but the knee remained absolutely stiff 3 weeks after the operation. The patient has continued fairly well, walking on her leg but without any motion.

Synopsis: Septic arthritis of the left knee. Insertion of Cargile membrane. Recovery without motion.

Case 3.—J., white, male, age 6 years, was admitted to the hospital October 28, 1907.

The patient has tuberculous arthritis of the knee and of the tendon sheath of the wrist. Duration of the disease has been 3 years. The knee is slightly flexed at 20 degrees and there is a subluxation backward of the tibia. There is no sinus. The knee is swollen but without rise of local temperature. The X-ray picture shows an erosion of both condyles of the femur. There is no motion in the joint, but the X-ray picture would indicate that this ankylosis is a fibrous one. On April 28, 1908, an arthrotomy was performed by making lateral incisions on both sides of the knee. Fibrous ankylosis was found to be present between the patella and the femur and between the tibia and the femur. These adhesions were broken up by means of a periosteal elevator, but the disease did not look absolutely quiescent. The ordinary Cargile membrane was inserted between the ends of the bones and beneath the patella, and held in place by catgut sutures. The wound was closed without drainage and the leg put up in a plaster spica. There was a slight rise of temperature, going up to 102° F. the day after the operation, and continuing slightly elevated for 4 weeks. The first dressing was made on May 6, 1908, 8 days after the operation, and the wound was healed *per primam*. On May 15, 17 days after the operation, there was a small sinus formed at the end of the wound and the remains of the Cargile membrane was sloughed out with a slight amount of tuberculous pus. This sinus continued to remain open for 3 months after the operation, when it finally healed.

Synopsis: Boy aged 6. Tuberculosis of the knee and tendon sheath of the wrist. Insertion of Cargile membrane into the knee for mobility, with the result of starting up the tuberculous process. A stiff knee resulted, but in better position, 3 months after operation.

Case 4.—S., white, male, age 6½ years, was admitted to the Johns Hopkins Hospital, in the service of Dr. W. S. Halsted, October 8, 1908.

The duration of his disease had been 4 years. The boy has tuberculosis of both hip joints with complete ankylosis in each one. He had been treated at other hospitals by means of extension and later by plaster spicas. On admission he was a rather emaciated little boy with his hips in the following position: right thigh is flexed at 25 degrees and left at 35, the left thigh is abducted 35 degrees and right thigh is adducted 35. There is absolutely no motion in either joint. There has been no sinus present, and the disease is apparently quiescent. Owing to the fact that both hips were absolutely immovable it was thought best to attempt to obtain motion in the right or adducted hip. The X-ray picture taken before the operation shows marked destruction of the head with a proliferation of new bone. On October 12, 1908, an arthrotomy of the right hip was performed, the joint being opened by means of an anterior incision. The capsule, which was thickened, was closely adherent to the bone. Any attempt to produce motion of the hip caused motion in the epiphyseal line, the epiphysis itself being tightly adherent to the pelvis. The head was separated from the acetabulum cavity and the acetabulum curetted, making as smooth a surface as possible. A membrane of chromicized pig's bladder was placed between the head and the socket and bound tightly about the neck, where it was sewed with catgut sutures. The wound was closed and the leg put up in plaster in a position of abduction of 20 degrees. The first dressing was made 8 days after the operation. Healing had taken place *per primam*. A plaster trough was left in which the leg should be kept in a position of abduction of 15 degrees, and passive motions were begun. On December 12, 2 months after the operation, the boy is able to get about, and there was a voluntary possible flexion of 35 degrees, abduction 15, adduction 10, and possible rotation of 25 degrees.

A letter received from the boy's father 1 month ago, i. e., 7 months after his operation, says the child is getting about very much better and can bend his leg nearly to a right angle. He says that he does not suffer any pain.

Synopsis: Tuberculous arthritis of both hips. Duration 4 years. Both hips ankylosed. Insertion of animal membrane with a gain in flexion of 35 degrees and corresponding gain in abduction and adduction, 2 months after operation, and report of possible flexion to a right angle, by his father, 8 months after operation.

Case 5.—R., age 4½ years, was admitted to the hospital November 7, 1908.

This child was born with a congenital synostosis between the head of the radius and the ulna. There is no ability to supinate the arm at all, and the dorsum of the hand points directly forward. Motions of flexion and extension at the joint are normal. X-ray plate shows the ankylosis of the bones together with a marked curvature of the radius, as it has been held continually in extreme pronation since birth. In all other respects the child is perfectly normal.

Operation for relief of the synostosis was performed November



CASE 11.—Radiograph. Gonorrheal arthritis of knee. Before operation.



CASE 12.—Radiograph. Gonorrheal arthritis of knee. Three months after insertion of Cargile membrane.



CASE 13.—Photograph. Gonorrheal arthritis of knee. Possible flexion 15 months after use of Cargile membrane.



CASE 4.—Radiograph. Tuberculosis of hip—double. Before operation.



CASE 5.—Photograph shows possible supination of forearm. 100 days after operation.



CASE 51.—Radiograph showing synostosis of radius and ulna before operation.

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CASE 5[2].—Radiograph of radius and ulna, 3 months after operation.



CASE 6[1].—Radiograph 6 months after operation with insertion of animal membrane. Tuberculosis of knee.



CASE 6[2].—Photograph showing possible flexion 6 months after operation. Tuberculosis of knee.



CASE 8.—Photograph. Possible reflexion, 40 days after operation.



CASE 8[1].—Radiograph of knee before operation, showing bony ankylosis. Gonorrheal arthritis.



CASE 8[2].—Showing possible flexion 40 days after operation. Gonorrheal arthritis.

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10, 1908. Incision was made over the outer aspect of the forearm below the olecranon, exposing the upper end of the radius and ulna. The periosteum enclosed these two bones as if in a sheath. This was separated by means of the chisel, and the bony ankylosis was removed. Supination was then allowed so that the hand turned about 100 degrees. One could get no further on account of the curvature of the radius. Cargile membrane was placed between the ends of the bones. The wound was closed and the arm put up in plaster with the arm in a position of supination of 100 degrees. The temperature rose after the operation until it reached 102° F. on the following day, and remained slightly elevated for 10 days after the operation. Massage was commenced on the 8th day following the operation and was continued for some time, but ankylosis reoccurred in about 30 days following the operation. The membrane here used was the ordinary Cargile membrane.

On February 25, 1909, the patient was readmitted to the hospital and operated upon the following day. The synostosis was found to have reformed and bony ankylosis to have taken place. Chromicized pig's bladder was inserted between the ends of the bone as in the former operations, and the arm put up in supination of 100 degrees. A slight temperature reaction took place, which persisted for 10 days after the operation. Massage has been kept up since 8 days after the operation. To-day, 100 days after the operation, supination is possible up to 100 degrees, but the arm as yet can go no further owing to the twist in the radius. A brace is being used in the attempt to bend the radius into its proper position. If it were not for the fact of the curving of the radius it is quite possible that supination would be entirely normal.

Synopsis: Child 4½ years. Congenital synostosis of radius and ulna. Mobility of 110 degrees produced by introduction of chromicized pig's bladder.

CASE 6.—B., white, female, age 14 years, was admitted to the Johns Hopkins Hospital, in the service of Dr. W. S. Halsted, December 10, 1908.

Child has tuberculosis of the knee. Duration of disease 10 years. For the last 3 years the knee has been perfectly well so far as any active process was concerned, and she has been walking on it with flexion of 10 degrees but absolutely no mobility. The patella is tacked down firmly to the top of the femur, and there is fibrous ankylosis between the head of the tibia and the femur. An operation was performed to produce motion. Lateral incisions were made on both sides of the knee, and complete fibrous ankylosis was found between the patella and the femur and between the femur and the tibia. This was separated by means of a periosteal elevator and passive motions made until the normal amount of motion was obtained. Chromicized pig's bladder was inserted between the patella and the femur and between the femur and tibia so that the raw surfaces were completely shut off. The membrane was sewed in place by means of catgut sutures and the wound closed. A plaster dressing was put on the leg while the leg was in full extension. For 3 days following the operation there was a slight rise of temperature to 101° F., but after that time it remained normal. On the 8th day the plaster was removed and passive motions instituted. The child was allowed to walk at the end of 3 weeks. To-day, 6 months after the operation, the condition is as follows: The leg can be brought into full extension and can be flexed at 75 degrees. There is no pain on motion, and the child walks with a slight limp which is due to a shortness of the leg from her early tuberculosis.

Synopsis: Girl 14 years of age. Tuberculosis of the knee of 10 years duration, with complete fibrous ankylosis. Arthrotomy and insertion of animal membrane and recovery of function of 75 degrees.

CASE 7.—L., white, female, age 16 years, was admitted to the hospital December 28, 1908.

This is a case of tuberculosis of both hips and also tuberculosis of the sacrum for the past 6 years. Right leg is in a position of flexion of 95 degrees, adduction 75 degrees. It lies entirely across the body and is rotated inward 20 degrees. The scar of an old sinus is seen 15 cm. below the trochanter. There is complete bony ankylosis at the hip joint. An X-ray picture shows marked destruction of the head and new bone formation about the hip joint with coxa vera. The left leg is flexed at 110 degrees, abduction 20, external rotation 10 degrees. Hip is almost completely ankylosed, and radiograph shows marked bony destruction at the hip joint. When the patient attempts to walk she assumes a squatting position, feet, buttocks, and hands resting on the floor. There is a discharging sinus along the left side of the rectum; a bismuth injection and an X-ray plate show that the starting point is in the left side of the sacrum. Operation was performed on the left hip on December 30, 1908. A Hoffa-Lorenz incision was made over the right hip joint, and the head of the bone was separated from the acetabulum cavity by chiseling through the new bone formation. The cartilage of the hip had been almost completely destroyed, as well as that of the acetabular cavity. All the adductor muscles were divided by the open method, and the leg was then brought down from its position to 90 degrees flexion and 20 adduction, so that it lay perfectly flat and was in 15 degrees of abduction. Chromicized membrane from pig's bladder was inserted between the head and the acetabulum cavity and secured about the neck so that the head was completely covered by means of catgut sutures. The wound was closed and healed *per primam* within 10 days. At that time massage and passive motion were instituted and kept up for the following 6 weeks. At the present time the leg is lying flat on the bed, there is voluntary flexion of 50 degrees, abduction of 30, and adduction of 10. The hip is not painful and the patient can bear her weight upon it without discomfort. She has not progressed so rapidly as she would have done, owing to the fact that we have been trying to keep her quiet on her back so as to heal up the focus in the sacrum by means of bismuth injections, which so far have failed.

Synopsis: Girl with tuberculosis of the right hip. Duration 6 years. Complete bony ankylosis and deformity of 90 degrees flexion, 20 adduction, and 15 of internal rotation, and now has motion to the extent of 50 flexion, 30 abduction, 10 adduction, and good rotation in and out, 156 days after operation.

CASE 8.—S., white, male, age 20 years, was admitted to the hospital April 18, 1909.

Patient has complete bony ankylosis of left hip and left knee joint. He was taken suddenly with acute rheumatism which settled in the hip and knee 3 years ago. The inflammatory condition remained in each joint for 3 months. Patient was in bed for 9 months. The onset of this condition of the joints was preceded by gonorrhea 2 weeks before. On admission the left leg was held in a position of abduction of 15 degrees and of flexion of 15 degrees. It was not tender but was absolutely immovable. The X-ray picture shows entire destruction of the head and the acetabulum cavity with new bony ankylosis. The knee is flexed about 10 degrees; the patella is immovable, and not the slightest motion is to be obtained between the femur and the tibia. The X-ray picture of the knee shows entire destruction of the joint surfaces with bony ankylosis between the patella and femur as well as between the tibia and femur, with the formation of bone behind the condyles and in front of the articulation of the femur and tibia. The boy was absolutely incapacitated owing to the ankylosis of both hip and knee joint on the same side, and it was deemed best to attempt to obtain motion of his knee joint at this time. On April 20, 1909, an arthrotomy was performed on the left knee. A perpendicular incision was made on either side of the knee joint, and complete bony ankylosis was found between the patella and femur and the femur and tibia. One was unable to separate these by a periosteal elevator, and they had to be cut through by means

of a chisel. After a good deal of difficulty this was accomplished, separation at the line of the articulation was made, and the new bone formation in front of and behind the condyle was chiseled away. Chromicized pig's bladder was inserted, one piece between the femur and tibia, and another piece between the patella and femur, until the entire joint was covered. These were sewed in place by means of catgut sutures at the reflexion of what should have been synovial membrane. The wound was closed and the leg put up in plaster in full extension. The day following the operation the temperature rose to 101° F., but reached normal again in 8 days. On the 10th day the cast was removed and the wound had healed *per primam*, and passive motions were begun. The boy left the hospital on May 30. In 41 days after the operation he was walking with the aid of a cane and bearing his weight on his leg. At this time the patella was freely movable, passively and actively. He has the ability to move his knee 35 degrees, and the possible flexion and extension have been increasing daily.

Synopsis: Gonorrheal arthritis in a boy of 20, with complete ankylosis of the knee and hip for 3 years. An arthrotomy of the left knee with substitution of animal membrane was performed, with the result of 35 degrees of active flexion 40 days after operation.

As has been said, this paper is presented to point out the methods used rather than to draw any definite conclusions. The small number of cases and the short space of time since the first operation (one year and a half) prevent us from making too definite statements. It seems, however, that certain suggestions offer themselves, from a study of the cases, which it is worth while to consider.

A definite amount of permanent mobility has been obtained by the insertion of chromicized pig's bladder into a joint, provided the membrane can be retained intact for a period of 30 to 40 days. In Cases 1, 2, and 3, where simple Cargile membrane was used, no permanent motion was obtained owing to the fact that the Cargile membrane is absorbed in a period of 10 to 15 days. In Cases 4, 5, 6, 7, and 8, where the chromicized pig's bladder was used, a membrane which remains at least for 30 days, a permanent amount of motion resulted in each case. Case 4, tuberculosis of hip, gave 35 degrees of flexion after 8 months; Case 5, synostosis of elbow, gave 110 degrees of motion after 3 months; Case 6, tuberculosis of the knee, gave 75 degrees of motion after 6 months; Case 7, tuberculosis of the hip, gave 50 degrees of motion after 5 months; and Case 8, gonorrheal arthritis of the hip, gave 35 degrees of motion after 40 days. In each case the amount of motion has been permanent and of definite utility. Passive and active motions, together with massage, have been instituted immediately after the first dressing, *i. e.*, not later than the 10th day, and continued daily. This is essential in the production of motion and should be insisted upon notwithstanding the discomfort, for in every case the muscles are so atrophied from disuse that it is necessary to stimulate them into action.

The amount of motion stated in these cases is active and not passive. In the limits of active motion the joint motion has been free of pain, in each case. The joint as far as possible has been restored to its normal state, and there is no bulky foreign material to cause discomfort by its presence.

The character of the motion has been as normal as the anatomical changes in the shape of the bone will permit. There is an absence of the wabbling which is seen in cases where a muscle or fascia flap is inserted between the bones. In hip joint cases the deformed head of the bone fits closely in the socket, and there is an absence of that waddling congenital hip-like motion.

Our cases have shown a post-operative rise of temperature which persisted from 3 to 10 days, but suppuration has not taken place except in Case 3, where a tuberculous discharge was set up. This was a case of tuberculosis of the knee with fibrous ankylosis. Our enthusiasm led us to operate before the process was entirely quiescent, and, while no harm was done, no good was accomplished. One should be sure in all ankyloses from tuberculosis that the disease has been entirely quiescent for quite a long period before attempting operation. In Cases 4, 6, and 7, tuberculosis of the hip and knee, where all signs of the infection had been dormant for over a year or more, no trouble was encountered, and they gave gratifying results.

The joints operated upon in this series have been the hip, knee, and elbow. They all lend themselves readily to the insertion of the membrane. The best incision for an arthrotomy of the knee has been found to be a lateral incision on either side of the patella, while the anterior incision from the anterior superior spine gives us the best exposure in cases of ankylosis of the hip.

The entire success of the operation depends upon the character of the membrane used. In the first place it should be absorbable. Secondly, it should remain intact from 30 to 40 days. Thirdly, it should be pliable enough to be adapted to the contour of the joint. Every raw surface should be absolutely separated by it from that with which it would normally come in contact. The membrane should have body enough to prevent its tearing, and it should be firmly held in position by absorbable sutures.

Our results of permanent motion attained by the use of chromicized pig's bladder in ankylosed joints have been such as to make a more exhaustive study of the method advisable.

THE MUNICIPAL MANAGEMENT OF TUBERCULOSIS.

By Wm. Charles White, M. D., Pittsburg, Pa.

On going over what I have to say to you on the subject of municipal management of tuberculosis, there arose in my mind the closing sentence in one of the paragraphs of Walter Bagehot's essay on Hartley Coleridge, which runs as follows: "If we are to be dull, surely we will be dull in silence. Do not sermons exist, and are they not a warning to mankind?" The serious phase of the tuberculosis problem which I wish to present partakes a good deal of the nature of a sermon, yet I trust that our experience may contain a lesson or two for some of my hearers.

The tuberculosis question in any municipality has two definite problems to be solved; first, the medical problem; and second, the sociological problem, which invades every portion of the social fabric of our country.

The medical side is, of course, a most important factor, involving, as it does, such problems as pointing the way, making early diagnoses, the care of the already sick, and the search of the still elusive specific cure.

The medical profession, while it does wonders through many of its members, yet constitutes in itself one of the most serious problems of the sociological side of the tuberculosis situation. A large proportion of the profession are still ignorant of the fundamentals underlying our present conception of tuberculosis as a disease and the cure of the same. Many years must pass before the difficulty is eradicated by the production of more careful doctors through better teaching in our schools.

While this is true, there is much criticism fairly offered by the majority of the profession on that increasing group of medical men, the tuberculosis experts. So often these are men who know little else of medicine than tuberculosis, and who spend much time in criticism and abetting criticism of the woeful lack of knowledge of that potent group, the general practitioners. Oftentimes the only recommendations many of the experts have is that they have had tuberculosis themselves and have in consequence studied this one disease carefully. Too many specialists to-day are experts in picking out a small tuberculous focus rather than experts in tuberculosis.

In studying certain discrepancies in statistical life problems, which appeared when the time reckoned was only that from birth to death, Pearson made the interesting discovery that the discrepancies disappeared completely when the nine months between conception and birth were taken into account. So with the above discrepancies many of them will disappear when we take into account the time before the birth of the doctor, and establish some better method of teaching this disease which in its clinical aspect to-day is looked upon still as one which every doctor knows about without teaching.

In this doctor's pre-natal period some of the mistakes are so gross as to be unpardonable. The hospital where he is taught admits no tuberculous cases. In spite of this law tuberculous cases are entered for operation, from mistaken diagnoses, for child-birth, through influence, etc., and the ordinary precautions of prevention and cure are neglected. Consequently the embryo doctor is untaught; but infinitely worse, the very place which should be a model for education in this line becomes a source of great danger of infection to those whose duty calls them there. Ask yourselves of the hospitals of your own knowledge and of the doctors and nurses that have fallen during their course. How many hospitals use burnable closed sputum cups in place of porcelain ones, on which the sputum dries and scatters and flies gather? Do not influenza, pneumonia, typhoid fever, and other sicknesses spread in like manner from the sputum?

How much better it would be for hospitals to-day to say, we take tuberculous cases, teach our doctors, students, and nurses carefully about it, use every precaution for prevention and cure. If this were done there would not be to-day the long list of sick placed on the debit side of our carelessness account, the tremendous fear of the sickness, and the ignorance of preventive measures.

One word more. The difficulty of finding to-day a nurse who knows anything about tuberculosis, and who is not afraid of it, save one of the group who have suffered from it, must have struck most of you. No wonder, when the above condition exists in our hospitals. About all we do in the hospitals in regard to a nurse's relation to tuberculosis is to neglect to guard her against infection with tuberculosis.

The Tuberculosis League of Pittsburg has attempted to help these difficulties by arranging to furnish the larger hospitals with burnable cups, and by establishing an extension course for nurses in the Tuberculosis Hospital, which it now carries on with the Western Pennsylvania Hospital and the Homeopathic Hospital, giving each nurse two months' training in tuberculosis nursing and district work. The educational result from this connection your imagination will supply both for the hospitals and homes of the municipality.

The sociological problem, however, is the broader field and envelops much of the above tuberculosis work to-day. There are three groups actively interested: The State, the health authorities of the municipality, and charitable organizations. There is, of course, work for all. The greatest difficulty at present is to establish some correlation or centralization of work which will prevent waste of energy.

It is the State's duty to look after the work in those parts of the State having no other health control, and to help those municipalities from which she demands the care of their own public health without, however, dissipating the work of the municipality.

In the municipality which is large enough to be entrusted with its own public health government, the work should undoubtedly be centralized in the department of health of the city. The care of the city's poor consumptives should be provided for by public taxation.

The charitable and private organizations have double duty:

1st. They must educate the inhabitants of the municipality to the point of accepting and carrying out this duty.

2d. They must provide for the great body of unfortunate consumptives who are not wholly destitute.

Let me repeat again that the removal of this scourge is a matter of public health, and that all labor that is done should be with the ultimate intention of centralizing the work with some permanent policy in the municipal department of public health. Here should be a record of every case in the city, its source and danger of infection, and the assurance of its proper care by public or private measures.

Most of the active work to-day emanates from private charitable sources, and the accomplishments of these, as well as their mistakes, may well be reckoned with as part of the arma-

ment of the municipality when the work is finally safely lodged in its hands.

In the foremost rank stands the educational work. This to be effective must be placed upon the same basis of repetition and continued effort that marks the value of all other useful educational work; it must have for its object a fully educated community in which no one has escaped the gospel. Reiteration must be its bulwark. I have little faith in spasmodic and grand-stand work—such as the graphophone and the brass band. The effect is not lasting nor are the results permanent. I fear the special lecture to adults is in part open to the objection also that the effort is spasmodic and the audience past the impressionable age.

It would seem of more value to utilize continuously as with other educational work the permanent educational gatherings, the school and the church, with a permanent exhibit in some public building where people gather constantly, which exhibit would teach in a graphic way, with few words, the way to care for a consumptive at home, and the laws governing the prevention and cure of this disease.

With this conception of the work, the Tuberculosis League two years ago made the effort to establish in the schools of Pittsburg some definite systematic course of study that could be continued year after year, and eventually result in a saturated community. After much personal labor they obtained a concession which allowed them to put a nurse, Miss B. Stark, who was admirably fitted for the work, in charge of the task. Miss Stark developed the field admirably, and has made the teaching acceptable to children, teachers, school management and homes. Her work consists in talks to teachers, talks to children, talks to mothers, exhibits in school halls, and simple pamphlets sent with the children to the homes with the urgent request that in the home they tell what they have heard. We believe that the phrase "a little child shall lead them" may contain the solution of many of the problems contained in Miss LaMotte's interesting and distressing study.

Hospitals.

We miss by half the value of hospitals for consumptives by moving them so far away from the town. I do not mean that at times the country is not much better than the town, but that it is not enough better to counteract the influence on the town itself. I know of no more potent educational factor in tuberculosis work to-day than the existence, in the midst of the city, of a hospital of wide porches and shacks filled with beds in which tuberculous patients recover. A spot can usually be chosen which has open space around, and I am convinced of this, that when we realize that tuberculosis is a malady that must be treated as carefully, individually and collectively, as typhoid fever and pneumonia, we will be able to cure as well in such places in town as in the country.

A hospital in such a place helps to overcome the fear which has resulted from our modern methods, helps to teach the friends of patients how to do the trick, by rapid turning over of patients accomplishes wonders in individual education of the consumptive, and beyond all, stimulates the municipality to the belief that it is an economic problem which will result in money saving for it to care for its own consumptives, and to have the money expended in such care spent in its own market. Let me repeat again for the municipality, the question of tuberculosis is a public and private municipal business.

Nothing perhaps is more common to-day in tuberculosis work than the consumptive who has been put in a condition of partial recovery who returns to labor and old home conditions, only to break down, and with lost chances to try to do the whole thing over again. The first cure business is a revelation; the second, often a hardship never completed. This problem, which may be stated as the "problem of conservation of work done," is a very serious one.

Much of the belief of climatic specificity is doubtless due to relapse following long railway journeys and the excitement of home coming.

The conservation of work done I believe can only be accomplished by a carefully correlated system in which the patient is moved from department to department, as the supervision of his case requires more or less attention. A specific example will illustrate: A is found to have active tuberculosis with fever in the dispensary; he is moved to the hospital where with strict care he becomes well enough to move around and start work; he is then moved to the farm and gradually worked back to eight hours of labor a day; he is then moved into the night camp and his regular work; he is then discharged with supervision of dispensary and the dispensary nurse. The night camp, which provides proper facilities, food, and supervision, must, I think, take an active part in this conservation work.

Time will not allow full discussion of the following detail problems which each municipality must meet through its health authorities. The inspection, segregation of cases under proper care and fumigation of orphan asylums, jails, homes, insane hospitals, public hospitals, charitable institutions, etc., but these are for years past the hotbeds of many cases, and need most rigid handling.

The maternity cases, which form a serious difficulty, must be met also. There will be tuberculous maternity cases as long as the world lasts. In the past and at present they do very badly. We have attacked the problem in a small way in Pittsburg, and our evidence is to prove that if mothers be put under good conditions through the later periods of child-carrying, and the birth is hurried through and no nursing allowed, this question is not so serious as has been thought. Of course, vomiting cases and special cases call for special care, but in the main a maternity department of a tuberculosis hospital is bound to be of necessity a powerful adjunct of prevention work.

The open-air school, in conjunction with medical inspection of our school pupils, needs only be mentioned, as you are all familiar with its value.

I belong to those who, for the sake of the 11 per cent of the tuberculous of bovine origin (I believe a much larger percent-

age than this will eventually be proven to have this source), think that merely for the 11 per cent we must, with the utmost severity in every municipality, control our milk, cheese, and butter supplies, and have the assurance that they do not come from tuberculous cows. This is more important than the meat inspection for tuberculosis, I think.

Our struggle must be for an immune race, not for the extermination of every last tubercle bacillus, which is apparently the hope of many. More and more we see the evidence of protection of small doses in healthy resistant bodies. In our municipalities then, our plan must be to get rid of the sources of large doses of tubercle bacilli, and to establish resistant bodies by healthy lives, mainly in our children.

In our endeavors to do what seemed best for the municipality of Pittsburg, the Tuberculosis League, a public charitable organization, prepared and, after much labor, succeeded in having passed a municipal ordinance which should centralize the tuberculosis work in the bureau of health in such a way as to establish a permanency of policy and prevent dissipation of work. The ordinance is as follows:

Creating and establishing in the Bureau of Health under the Department of Public Safety, the Division of Tuberculosis Inspection and Relief, prescribing the powers and duties thereof; how the same shall be controlled and exercised and the number of employees and their salaries.

Sec. I. Be it ordained and enacted by the City of Pittsburg in Select and Common Councils assembled, and it is hereby ordained and enacted by the authority of the same,

That there shall be and is hereby created and established in the Bureau of Health, under the Department of Public Safety, a separate division to be known as the Division of Tuberculosis Inspection and Relief.

Sec. II. That said division shall be under the superintendence and direction of a commission consisting of the Superintendent of the Bureau of Health and four competent and skilled citizens who shall be appointed by the Director of the Department of Public Safety for terms of seven years and serve without remuneration, and which commission shall be designated as the Tuberculosis Commission of Pittsburg. Said commission shall adopt such rules and regulations as they may see fit, not inconsistent with any general law or ordinance, and shall elect one of their number as President and one as Secretary. Vacancies occurring in said commission shall be filled by appointment of the Director of the Department of Public Safety for the full term.

Sec. III. That said commission shall prepare and keep accurate records of all cases of tuberculosis existing in the municipality in such form and detail as said commission shall prescribe, inspect all dwellings, tenements, shops, factories and other places where cases of tuberculosis exist, ascertain the cause of infection and provide for the disinfection and cleansing of the same, and report to the proper department cases needing charitable relief; establish dispensary stations; prepare and disseminate information as to the cause, treatment, and relief of tuberculosis and generally do such work and adopt such measures as will tend to control and eradicate the infection.

Sec. IV. That said division shall have attached thereto one clerk at a salary of one hundred and twenty-five ($125.00) dollars per month, and five trained nurses, clothed with police power, at salaries of seventy-five ($75.00) dollars per month, all of whom shall be appointed by the Director of the Department of Public Safety.

Sec. V. That it shall be the duty of the Director of the Department of Public Safety to provide suitable accommodations in connection with the Bureau of Health for the use and occupancy of said division.

Sec. VI. That any ordinance or part of ordinance conflicting with the provisions of this ordinance be and the same is hereby repealed, so far as the same affects this ordinance.

The nurses, you will see, have police power, the commission is unpaid, and as now appointed has represented on it the State, the city and the tuberculosis charity. It exists for seven years, which insures its policy from interruption. While the State law provides for registration and sequestration of tuberculosis cases dangerous to public health, it must not be thought that this commission can accomplish anything by roughshod methods. It must by gentleness, guidance, and tact steer the way, which it is hoped will eventually result in what is best for the municipality, a tuberculosis management centralized with permanent policy in the Department of Public Health, with a registration there of every case in the municipality, its source and danger, and *the assurance* that it is being properly handled, whether by State, city or charity means.

To-day one of the most serious problems, of course, is the fusion of State and city functions in some way to prevent waste. Personally, I feel that tuberculosis in municipalities entrusted with care of the public health, must be handled by the municipality as a matter of health and charity, with the assistance of the State. The latter, however, must assist in the municipality, and not conduct independent work, which can only lead to dissipation of forces and of money. There is work for all in tremendous amount, but let us be careful that the base and foundation of our work be so firm and broad that it will maintain a superstructure of continuous growth and any size. This, I think, might follow the classification of duties outlined early in this address.

Let me quote as my apology Browning's verse from "Rabbi Ben Ezra":

> Now, who shall arbitrate,
> Ten men love what I hate,
> Shun what I follow, slight what I receive,
> Ten, who in ears and eyes
> Match me; we all surmise,
> They this thing, and I that; whom shall my soul believe?

INDEX TO VOLUMES 1-16 OF BULLETIN.

A subject and author index of the first sixteen volumes of the Johns Hopkins Hospital Bulletin has been published.

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CHLOROFORM POISONING. LIVER NECROSIS AND REPAIR.

By G. H. Whipple, M. D.,
Associate in Pathology,

AND

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(*From the Hunterian Laboratory of Experimental Pathology and the Pathological Laboratory, Johns Hopkins University.*)

There are several important points with which this paper deals and they may be stated briefly as follows: The work of various observers (Howland, Wells, Muskens, and others), together with our own, proves beyond any doubt that chloroform is a powerful poison, that narcosis with this drug for any considerable length of time invariably causes central necrosis of the liver (in animals), and that this necrosis, if extreme, will cause death. Animals vary greatly in their susceptibility to the drug, and a narcosis of short duration may prove fatal or cause but little liver necrosis. It will be shown that chloroform invariably causes a uniformly distributed central liver necrosis, however the blood supply of the lobule may be varied —whether the hepatic artery is ligated or the portal blood excluded from the liver by an Eck fistula. When recovery ensues the repair of this necrosis, which may have involved one-half or more of every liver lobule, is very rapid, and the liver is restored to normal in two or three weeks. This repair is perfect and leaves no scars nor distortion of the lobulation. For the sake of comparison the report of a case of chloroform poisoning in a woman has been added. It will be seen that anæsthesia with chloroform for but 35 minutes caused death four days later, and the autopsy findings correspond exactly with those in dogs, the essential lesion being extreme central liver necrosis (Figs. 1 and 12).

A general discussion and review of the literature is not called for, as there have been several excellent papers during the present year which review the subject thoroughly (Howland and Richards, Muskens). Muskens has collected a large number of fatal cases of chloroform poisoning and gives a very elaborate review of the literature. Müller gives a long series of experiments with various anæsthetics, but his conclusions differ widely from those of Lengeman, who shows that prolonged ether anæsthesia causes no damage to the viscera. Other workers have confirmed Lengeman's conclusions. Many of the chemical problems have been studied by Wells, Howland, and others. Experiments by Stiles and M'Donald show that the rabbit is quite susceptible to chloroform poisoning, and the pathology is similar to that described below as found in dogs and man. Ostertag gives experiments on many different animals—rabbits, guinea-pigs, pigeons, rats, cats, and dogs. He found the same lesions in all, but his conclusions were wrong. He considered the fatty degeneration of the heart to be the essential lesion and the liver changes to be secondary.

I. Chloroform Poisoning in Dogs.

In this series of experiments the cases of severe or fatal chloroform poisoning are here brought together for study, and brief reports of the characteristic cases follow.

The method was practically the same in all of these experiments. The animals were all healthy at the beginning of the experiments. No morphia was administered. Anæsthesia was begun with ether because of the ease with which an animal can be killed with chloroform in the early stages of narcosis. Chloroform was given to produce light anæsthesia only, the animals moving the legs or head slightly during the major part of all anæsthesias. Muscular twitchings were found to be evidences of poisoning and high susceptibility as a rule, but not necessarily of deep anæsthesia. Animals were kept under close personal observation during all the experiments. Autopsies were held immediately after death. In case the animal was sacrificed, this was accomplished by ether anæsthesia and bleeding from the jugulars. Tissue was preserved in Zenker's fluid and in formalin, the latter especially for the study of fat. The chloroform used was Mallinckrodt's purified chloroform for anæsthesia "M. C. W."

Delayed Chloroform Poisoning.

Dog 19, small fox terrier, bitch, weight 14 pounds.

March 11. Anæsthesia (ether start). *Chloroform* for 2½ *hours;* 1.25 *ounces* used. Anæsthetic well taken and recovery was rapid.

March 12. Seems rather sick, a little vomiting.

March 13-14. Improving slowly, no vomiting.

March 15. Anæsthesia (ether start). *Chloroform* for 1½ *hours;* I *ounce* used; anæsthetic well taken, recovery rapid, lively and active in afternoon.

March 16. Much vomiting and some diarrhœa.

March 17. Drowsy and dull all forenoon; died 5.30 p. m.

Autopsy.—Dog is very well nourished. Serous cavities are quite normal. Thorax, heart and lungs normal. Spleen, pancreas, and kidneys normal. Stomach shows a deep red, swollen mucosa, but no hemorrhages. Duodenum: here are a few superficial erosions, measuring 5 x 2 mm., just below the pylorus. They involve the mucosa only, and there has been but little hemorrhage. Microscopical section shows a little superficial necrosis of the mucosa. Intestines are normal.

Liver is enlarged, pale and very fatty looking. On section the lobules are very sharply outlined with a deep red, clean-cut center and an opaque, yellowish, swollen margin. Gall bladder and bile ducts are normal. Microscopically there is extensive central necrosis, about three-fifths of all the liver cells being killed and appearing as pink-staining hyaline masses. Wandering cells of all types have invaded these areas about the hepatic or efferent veins. There are great numbers of polyblasts and many giant cells surrounding or invading the areas of necrosis. The peripheral liver cells (those about the portal structures) are greatly damaged and full of fat vacuoles. There are numerous mitotic figures indicating a vain attempt at repair of this extensive injury. The bile ducts are unchanged. The areas of central necrosis contain no fat (fat stain, Sudan III) or at most only a few very fine droplets, but the liver cells in the periphery of the lobule are full of large and small fat droplets. This organ contains practically not a single normal liver cell, and may well be called a condition of *acute yellow atrophy.*

ACUTE CHLOROFORM POISONING.

Dog 32, mongrel, Scotch terrier, male, weight about 22 pounds.

May 5. Anæsthesia (ether start). *Chloroform* for 2 *hours;* 1 *ounce* used. Anæsthetic not very well taken.

May 6. *Chloroform* anæsthesia 1 *hour and* 15 *minutes. Half an ounce* used. In the afternoon the dog is vomiting and looks quite sick.

May 7. The dog is vomiting frequently, appears weak and drowsy. Staggers when walking. Died at 11 a. m.

Autopsy at once. Animal is very well nourished. The peritoneal cavity contains 30 to 40 cc. of fresh, unclotted blood. The omentum contains numerous small ecchymoses, which are found as well below the serosa of the stomach and in the neighborhood of the pancreas. Some of these small hematomata measure 1 to 1.5 cm. in diameter. Thorax and lungs are quite normal in gross. *Heart* is pale and rather flabby; otherwise normal. Microscopically the muscle fibres show much fragmentation. Fat stain reveals great numbers of fine droplets between the muscle fibres everywhere. *Spleen* is normal in gross. Microscopically the spleen pulp contains a great many polymorphonuclear leucocytes and much yellow, granular, refractile pigment. *Stomach* contains mucus mixed with black, tarry material which adheres to the mucosa. There are no ulcers in the mucosa, but a few superficial erosions. Duodenum and intestines are normal. *Kidneys* appear normal in gross, but the medullary rays of the cortex are rather opaque and yellowish. Microscopically the section is normal. Fat stain shows the convoluted tubules (distal to the glomeruli) to contain fine droplets of fat in small amounts. The straight tubules in the medullary rays contain large amounts of fat. *Bone marrow* of femur is deep red and uniform. Microscopically there are enormous numbers of polymorphonuclear leucocytes, whereas the red cell elements are inconspicuous. *Pancreas* is of normal size, but the parenchyma is of a delicate grayish pink. Scattered through the parenchyma are little chalky opacities of minute size. They are found only in the pancreas or in the fat close to the pancreas. They are not present in the omentum or peritoneal fat elsewhere. They are evidently small fat necroses, and are especially numerous close to the duodenum. Microscopically the pancreatic acini at the margin of many of the lobules show hyaline necrosis with invasion of this tissue by polymorphonuclear leucocytes. The fat adjacent to such areas shows the usual picture of fat necrosis outlined by a border of fragmenting and wandering cells. The centers of the pancreatic lobules seem to escape this necrosis. The retroperitoneal glands draining the region of the pancreas show areas of hemorrhage and opacities due to necrosis. *Adrenals* are normal in gross. Microscopically there are many polymorphonuclear leucocytes in the fascicular zone of the cortex. The medulla is normal.

Liver.—The capsule is thin. On the upper surface of the liver is a recent subcapsular hemorrhage of lenticular shape, measuring about 3 cm. in transverse diameter. There is a larger hematoma on the lower surface of the liver lobe close to the gall bladder, measuring 8 x 6 x 1.5 cm. This has ruptured into the peritoneal cavity, and from this evidently came the blood found in the peritoneal cavity. The cut section shows a very conspicuous lobulation. The lobules are enlarged, uniform in appearance, and very sharply marked out, presenting a deep red, clean-cut center occupying the greater part of each lobule, and a thin, opaque, yellow peripheral zone in close relation to the portal spaces which are inconspicuous. Microscopically the central necrosis is extreme, involving practically all of the liver cells except a row or two just about the portal structures. Many liver cells in this zone show a little necrotic mass of protoplasm contained within the cell membrane staining sharply with eosin, while the nucleus and remaining protoplasm stains normally. This appears to be partial hyaline necrosis of the liver cell. Stain for fat shows the central necrotic area to contain practically no fat droplets, which, however, are numerous in the marginal zone.

This case resembles closely that described above (dog 19), but is more acute, and the element of hemorrhage is more conspicuous in this case.

CHLOROFORM POISONING.

Dog 10, fox terrier, male, weight 21 pounds.

March 1. Anæsthesia (ether start); *chloroform* 2 *hours;* 2 *ounces* given.

March 2. *Chloroform* anæsthesia 2½ *hours;* 2 *ounces* used.

March 3. *Chloroform* anæsthesia 2 *hours;* 2 *ounces* used.

March 4. Very little vomiting and seems well in forenoon. Considerable vomiting and restlessness at noon. In the afternoon *chloroform* anæsthesia 1 *hour;* 1 *ounce* given.

March 5. Dog is very sick. Muscular twitchings are conspicuous. Died at 1 p. m.

Autopsy.—Animal is well nourished. The serous cavities are normal. *Heart* is normal. Microscopically the muscle cells are normal, and there is but very little fatty change. Lungs are normal. *Spleen* is slightly enlarged and presents a mottled, purplish red appearance. Microscopically there are scattered areas of necrosis in the pulp, indicated principally by accumulations of polymorphonuclear leucocytes. Pancreas is normal in gross and in sections. *Kidneys* are normal and contain no fat. *Stomach* is full of dark, bloody fluid. The mucosa is pink, and dotted over with little ulcerations measuring from 2 to 10 mm. in diameter. They present clean-cut edges, and are of oval or round shape. Also there are many small submucous hematomata, which are evidently the early stages of the ulcerations. *Small intestine:* The mucosa is deep red and a little swollen, but there are no ulcers.

Liver is large, swollen, and rather pale. The lobulation is very distinct, each lobule having a red central dot and an opaque, yellow, swollen margin. Microscopically the picture here is somewhat complicated owing to the repeated anæsthesias and consequent repeated necrosis combined with attempts at repair. There are no normal liver cells to be found, even those at the very margin of the lobule show fatty degeneration. The greater part of these liver cells have undergone necrosis. The central portion of the areas of necrosis has undergone solution or has been removed by the numerous phagocytes which are present, allowing great dilatation of the capillaries. The fatty degeneration becomes more striking as we go from the portal areas towards the areas of central necrosis.

NOTE.—This animal was much more resistant to chloroform poisoning than the two preceding animals (dogs 19, 32).

OBSTRUCTIVE JAUNDICE—CHLOROFORM POISONING.

Dog. 8, mongrel dachshund, male, weight about 22 pounds.

January 21. Operation and double ligation of common bile duct close to its entrance into the duodenum.

January 28. Urine is of very high color and contains bile. Feces are clay colored. Sclerotics and subcutaneous tissues are definitely jaundiced.

February 4. *Chloroform* anæsthesia for 2 *hours;* 2.5 *ounces* given. Rapid recovery. The animal seems well.

February 12. *Chloroform* anæsthesia 2½ *hours;* 3 *ounces* given.

February 13. *Chloroform* anæsthesia 2 *hours and* 10 *minutes;* 2.5 *ounces* given. During this anæsthesia an abdominal operation was performed, and a small piece of liver removed for examination. All the serous tissues were deeply jaundiced. The gall bladder was found dilated and very tense. Animal did not make a good recovery and died 36 hours later.

Autopsy February 15. The subcutaneous tissues are deeply jaundiced, but fat is well preserved. The serous surfaces are all

smooth, except for old adhesions about the liver. *Heart* shows many epicardial ecchymoses and is rather pale. *Lungs* and *spleen* are negative. Pancreas shows nothing of importance. *Kidneys* are rather pale.

Liver is much enlarged. The lobules are sharply marked out with a very deep red center, and a yellowish green margin. The common duct is found to be completely obstructed. The gall bladder is dilated and thickened and included in adhesions which undoubtedly prevented its rupture. Rupture of the gall bladder after this operation occurred in several animals. Microscopically the piece removed 36 hours before death shows extensive degeneration and necrosis of the central three-fourths of the liver lobule. There is extensive fatty degeneration in the liver cells at the periphery of the lobule. No mitoses are seen. The bile canaliculi are conspicuous, dilated with brown colloid material. Wandering cells are numerous in the areas of necrosis. Tissue removed at *autopsy* shows many mitoses in the peripheral zone of well-preserved liver cells; otherwise the appearance is practically the same as above.

Note.—Obstruction to the common bile duct seemed to influence in no way the lesion produced by chloroform. What part the operation played in causing the animal's death is uncertain, but probably inconsiderable.

Chloroform Poisoning with Hemorrhages.

Dog 18, small mongrel, male, weight about 15 pounds.

March 8. *Chloroform* anæsthesia 2 *hours*, 1.5 *ounces* given. Anæsthetic well taken. Considerable vomiting in the afternoon.

March 9. *Chloroform* anæsthesia 1 *hour and* 20 *minutes*, 0.5 *ounce* given. Animal died very suddenly during anæsthesia, although no chloroform had been given for 10 minutes before death.

Autopsy.—Thorax and abdominal cavity are normal. Heart, lungs, and spleen in gross and in sections are normal. *Pancreas* appears somewhat congested and shows a few minute yellow opacities showing through the peritoneum, probably fat necroses. The sections show nothing abnormal. The kidneys are normal. Stomach, mucosa is pale and covered with bile-stained material. The *duodenum* shows a deep red, swollen mucosa extending from the pylorus to the bile papilla, and in this area are two superficial ulcerations in the mucosa measuring 5 x 2 mms. The jejunum shows considerable swelling and congestion, but no ecchymoses nor ulcers.

Liver is greatly swollen and deep red in color. There are two subcapsular hemorrhages of lenticular shape, the larger measuring 20 x 15 x 3 mm. The cut section shows a very sharp lobulation, each lobule showing a deep red dilated central portion and a thin yellow peripheral zone. The organ is quite friable. Microscopically the lobules show a hyaline necrosis involving about one-half of the liver cells. The capillaries are conspicuous in the areas of central necrosis, and there are a few polymorphonuclear leucocytes and mononuclear wandering cells. Fat stain shows a good many droplets in the border zone between the necrotic central areas and the well-preserved peripheries of the lobules.

Note.—It is possible that this animal could have recovered from the liver necrosis, but there was a strong hemorrhagic tendency which is usually associated with the very susceptible cases which show acute chloroform poisoning. (See dog 32.)

Pregnancy, Acute Chloroform Poisoning and Hemorrhage.

Dog 31, large bull terrier, weight 38 pounds.

May 2. Anæsthesia (ether start). *Chloroform* 2 *hours*. 1.25 *ounces* given. Anæsthetic was poorly taken and there was considerable muscular twitching, although the animal was kept very lightly under so that she moved her head and legs during the entire time.

May 3. Animal seems well. Fetal movements can be felt through the abdomen. In the afternoon slight bleeding from the vagina noticed.

May 4. There had been some bleeding from the vagina during the night, but the animal seemed bright. There was some vomiting and little desire for food. *Chloroform* anæsthesia 1½ *hours*, 11 a. m. to 12.30 p. m.; 0.75 *ounce* given. Death at 2.30 p. m.

Autopsy at once. Animal is very well nourished. The subcutaneous tissues are very pale. The serous surfaces are smooth. *Heart* is dilated. The muscle is pale. Microscopically the muscle cells show a marked fragmentation. Fat stain shows great numbers of fine fat droplets in all the muscle cells. *Lungs*: all the lobes show small purple areas of hemorrhage 2 to 3 mm. in diameter. Microscopically a few of the alveoli here and there contain red blood cells and a few polymorphonuclear leucocytes. *Spleen* is of normal size and general appearance. Microscopically there are a few small focal necroses affecting the centers of the Malpighian bodies and areas in the pulp. These areas show little hyaline, pink-staining foci surrounded by numbers of polymorphonuclear leucocytes. The large megalokaryocytes are numerous in the pulp. *Kidneys* are normal. The medullary rays in the cortex are quite conspicuous as opaque yellow streaks. Microscopically a few of the tubules contain hyaline casts, but there is no scar tissue nor any acute inflammation in the kidney cortex. Some of the convoluted tubules (distal) contain a few small fat droplets, but the straight tubules in the medullary rays contain great amounts of fat. *Stomach*: the mucosa is pale, but shows a few ecchymoses and contains a little "coffee ground" material. The duodenum and intestines are normal.

Liver is large, swollen and friable. It presents the usual mottled appearance due to the conspicuous lobulation, each lobule showing a large red center and yellow, clean-cut edges. Microscopically the condition is practically that of *acute yellow atrophy* (Fig. 1). There are only one to three rows of intact liver cells about the portal structures, and fat stains show these cells to be full of large and small fat droplets. Even these marginal cells are beginning to degenerate, and a few mitoses can be found. The central portions of all the lobules show uniform very extensive hyaline necrosis. There are a good many wandering cells in these areas of necrosis. These cells are especially numerous in the immediate neighborhood of the blood vessels, from which they are evidently emigrating. There is little fat in the areas of necrosis.

Uterus fills up the greater portion of the abdominal cavity. The serous surface is smooth. The walls are thin and translucent, through which can be seen large blood clots. Incision shows the lumen to be full of clotted and fluid dark purple blood and eight pups. The placenta in each case has begun to separate from the uterine wall, and there has been more or less hemorrhage from this circular zone of separation. The middle zone of each placenta is attached loosely to the uterine wall, but can be separated easily from it. Microscopically the uterine wall and mucosa are normal. *Placenta*: the maternal edge of this organ shows an extensive fatty deposit in the epithelium covering the villi, but in addition there is a well-marked zone of necrosis in this same area. It is best seen associated with the thin zone of hemorrhage, which shows in the section. The remaining portion of the placenta is quite normal, and there is neither fatty degeneration nor necrosis.

Fetuses are all of the same size and general appearance, evidently about two or three weeks before term. Dissection shows the same condition in all. The serous cavities and viscera are quite normal. Microscopically the lungs and thymus are normal. Kidneys are normal. Some of the larger collecting tubules contain fat droplets. Heart: fat stain shows a deposit of small droplets in the muscle cells, not of an extreme grade, however.

Liver.—There is no evidence of any necrosis. In the connective tissue about the portal vein are accumulated a good many polymorphonuclear leucocytes. Fat stain shows a few small drops

in the neighborhood of the central venules of the lobules. Blood formation is still going on actively, and the liver capillaries contain great numbers of marrow cells and nucleated red cells, the megalokaryocytes being very conspicuous.

NOTE.—This case indicates that chloroform is just as toxic to a pregnant animal as to a normal animal. There is a zone of necrosis on the maternal side of the placenta which probably effected the placental separation and hemorrhage. The fetuses show no evidences of chloroform poisoning.

Summary.—Chloroform poisoning in dogs resembles that condition in human beings. The animal recovers from the anæsthetic and may appear quite well, then begins to vomit and may vomit blood. Diarrhœa may be present. The animal becomes more and more toxic and dies in one to four days. Post-mortem examination shows a uniform picture.

The *liver* shows the lesion of importance—a central hyaline necrosis, which may be so extreme as to involve all the liver cells except a row or two about the portal spaces. Fatty degeneration may be slight or extreme (Fig. 2) but is most intense in the boundary zone between the central necrosis and the intact liver cells about the portal spaces. There may be ecchymoses in the parenchyma or extensive subcapsular hemorrhage. The bile ducts and gall bladder are normal. *Kidneys* may show a little fatty degeneration of the convoluted tubules (distal) and considerable fat deposits in the straight tubules of the medullary rays. The latter condition is found in normal dogs but usually in less degree. *Heart* usually shows a little fatty degeneration and fragmentation. *Lungs* may show ecchymoses but usually are normal. *Spleen* may show focal necroses (microscopic). *Pancreas* may show fat and focal necroses, but is usually normal. *Stomach* and duodenum often show small submucous hemorrhages and shallow ulcers from which much blood may escape. The ulcers surely develop as a result of the submucous hemorrhages by a digestion of the mucosa overlying the blood clot. Ecchymoses may be found in any part of the body.

In *pregnancy* there is the usual central liver necrosis, and there may be considerable necrosis and fatty change in the maternal edge of the placenta. This may bring about placental separation and hemorrhage. The fetuses may show no lesions of importance.

II. CENTRAL LIVER NECROSIS.

By this term is meant a necrosis involving the liver cells about the efferent or hepatic venules of the lobules. This series of experiments shows that chloroform is a drug which, administered to dogs by inhalation for a period of one to two hours, will invariably cause central liver necrosis. Opie's experiments and observations on liver necrosis and injections led him to the conclusion that the vascular supply of the liver lobule might be a determining factor in the location of the necrotic zone. Therefore it seemed worth while to study this chloroform necrosis to see how it might be modified by various changes in the blood supply of the liver lobule. With this end in view various dogs were operated upon and the arterial blood supply partially or completely excluded from the liver. Chloroform anæsthesia gave the usual central necrosis. Two dogs with Eck fistulæ, in which the autopsies proved that the portal blood had been excluded from the liver, presented the usual central liver necrosis after chloroform inhalation.

LIGATION OF HEPATIC ARTERY.

Dog 37, small fox terrier pup, female, weight 11 pounds.

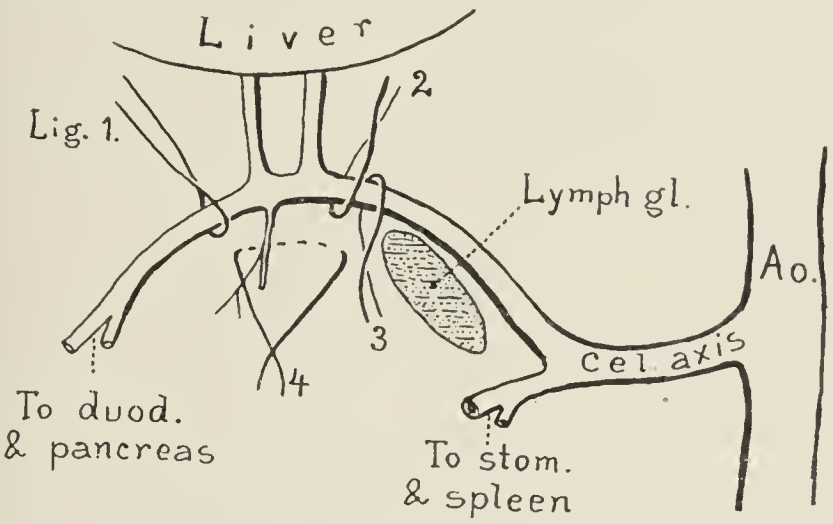
May 26. Operation (ether) and ligation of hepatic artery.

The operation as indicated in the figure was found to be the only satisfactory method of excluding arterial blood from the liver. It was found to be impossible to ligate the hepatic arteries proper, because they are embedded in dense fascia and very intimately associated with the portal system. Ligatures placed as indicated are effectual. It is essential to place ligature 4 as indicated, to include one or more small arterioles given off from the concavity of the arch and supplying the fascia and pancreatic tissue in that neighborhood. The operation is easily performed through a long right rectus incision.

May 28. The dog was well, appetite good. The wound is healing.

June 9. *Chloroform* anæsthesia 2 *hours;* 0.5 *ounce;* well taken.

June 10. Operation (ether), abdominal incision and removal of a large, wedge-shaped piece of liver. Microscopically (Fig. 4) the liver lobules show the usual picture of central necrosis involving



one-half of each lobule. The liver cells are pink-staining and hyaline, their nuclei showing pyknosis or fragmentation. There are many polymorphonuclear leucocytes in the areas of necrosis. Fat stain shows a conspicuous middle zone of fatty degeneration in which the liver cells contain large and small fat globules. The liver cells about the portal spaces are quite normal.

June 12. Recovery was rather slow, but steady. Abdominal wound broke down with exposure of the muscle.

June 21. Dog quite well and fat. Wounds are completely healed. Killed (ether and bleeding from jugulars). Pieces of liver removed at once and placed in fixing fluids. Then preparations were made at once for *arterial injection* with a vermilion gelatin injection mass. This injection mass is forced into the blood vessels under a pressure of 100 to 120 mm. of mercury. It is quite fluid when warm and easily passes the capillary bed. It solidifies when the animal is placed on ice, thus marking out the blood vessels with bright red cylinders of gelatin. The injection cannula is tied into the aorta just above the diaphragm. The aorta is clamped just above the renals. A clamp is placed on the vena cava below its entrance into the liver and on the portal vein just below the splenic branch. When pressure is applied the injection mass flows rapidly into the vessels of the stomach, pancreas, spleen, and intestine, but none escapes from the cut section of the liver. After some time a little of the injection mass mixed with blood escapes from the cut section of the liver. It is found that this comes from the portal veins by passing through the splenic capillaries, splenic vein, and portal branches of the liver. After hardening in the ice box, careful dissection showed that the

hepatic arteries contain no injection matter, and are completely cut off from the arterial tree. (See text figure.)

Liver. There are a few old adhesions around the sites of the two operations. Elsewhere the serous surface is smooth. The organ has a normal appearance. The lobulation is clean cut. The centers of the lobules are perhaps a little conspicuous, but the greater part of the parenchyma is brown and translucent. Microscopically (compare dog 40) the *repair* is almost complete (11 days' interval). The lobules are about normal size, but the centers are not quite filled in (Fig. 5). Here is seen a loose reticulum including a little yellow, granular pigment, and a few mononuclear wandering cells (polyblasts). Fat stain shows in the center only a few droplets of fat. Scattered here and there through the lobules in the middle or central zones are little nests of mononuclear cells (Fig. 5). Careful examination shows usually a central hyaline mass staining a diffuse pink about which the mononuclears have gathered. Some of these masses show deposits of lime salts. They are usually the size of two or three normal liver cells, and are undoubtedly remains of dead liver cells which have not as yet been removed but are surrounded by phagocytes. No mitoses are seen in the liver cells. The bile ducts everywhere are quite normal.

Note.—It is not easy to exclude the arterial blood from the liver, and this can only be assured by some control as the above injection, which shows that this operation did completely shut off the hepatic artery. The necrosis is of the usual type, as is also the process of repair, which will be discussed at some length in the following section, and reference will be made to this experiment.

Ligation of the Hepatic Artery.

Dog 34, mongrel, male, weight 20 pounds.

May 11. Operation exactly as described for dog 37.

May 13. Dog eating well. Wound healing.

May 14. *Chloroform* anæsthesia 2 *hours;* 1 *ounce* given. Anæsthetic well taken.

May 15. Animal killed (ether and bleeding from jugulars). Pieces of liver removed at once and injection through aorta as described in dog 37. Careful dissection showed that the hepatic arteries were completely excluded from the arterial stream.

Liver presents the usual appearance seen in chloroform poisoning. It is swollen and friable. The lobulation is very distinct. Microscopically the liver lobules show a central hyaline necrosis involving three-fourths of the liver cells. Many polymorphonuclear leucocytes have invaded the areas of necrosis. Fat stain shows fine droplets in the protoplasm of the damaged cells.

Ligation of Hepatic Artery.

Dog 38, fat fox terrier, male, weight 18½ pounds.

May 28. Operation (ether): ligation of hepatic artery exactly as indicated for dog 37. These two operations were done on the same day and under exactly similar conditions.

May 30. Dog is well; wound is slightly infected but healing.

June 8. Dog is well; wound is healed.

June 10. Operation (ether): abdominal incision and removal of a large wedge-shaped piece of liver tissue.

Liver is of normal appearance in every respect. Microscopically (Fig. 3) perhaps there is a very little atrophy of the liver cells in the center of the lobules where there are a few small droplets of fat. This indicates that ligation of the hepatic artery causes no appreciable effect on the liver.

Ligation of Hepatic Artery (Partial)—Chloroform Poisoning.

Dog 30, mongrel, male pup, weight 20 pounds.

April 22. Operation and ligation of hepatic artery as usual (see text figure). There was considerable bleeding and handling of the viscera.

April 23. Dog appears well. No vomiting.

April 29. *Chloroform* anæsthesia 2 *hours;* 1 *ounce* given; anæsthetic well taken.

April 30. Good recovery, no vomiting. Dog is active.

May 1. *Chloroform* anæsthesia 2 *hours;* 1 *ounce* given. Animal was alive at midnight.

May 2. Found dead in room, but body still warm.

Autopsy.—Peritoneal cavity is full of bloody fluid (75 cc.). There are no clots. The omentum contains numerous small hemorrhages and ecchymoses. Heart is normal. *Lungs*: there are a few small hemorrhagic patches in the right base not over 1 cm. in diameter. Microscopical sections show some œdema and congestion, and a slight exudate of polymorphonuclear leucocytes in a few of the alveoli. *Thymus* is large, œdematous, and contains numerous indefinite hemorrhages. Spleen, pancreas, kidneys show no change of importance. *Stomach* contains a large amount of fluid and "coffee ground" material. The mucosa shows a few superficial erosions and submucous ecchymoses. The duodenum above the bile papilla shows ecchymoses and considerable congestion. Microscopically there are many clumps of polymorphonuclear leucocytes all through the mucosa, and evidence of focal necrosis.

Liver.—Careful dissection of the structures at the hilum shows that the operation did not completely exclude arterial blood. Ligature 4 was not efficient and did not occlude a small arteriole communicating with the pancreas. Probably a small amount of arterial blood gained entrance into the liver by this means, but surely the greater part of the arterial blood was cut off. The liver in gross presents the usual appearance seen in extreme chloroform poisoning. It is large, mottled and very friable. The lobules are very conspicuous. There are a few old adhesions about the site of operation. Microscopically the liver lobules show a complete hyaline necrosis involving more than two-thirds of the liver cells. The marginal liver cells are well preserved, and the line of demarcation between the areas of necrosis and well-preserved liver cells is very sharp. There are many mitoses.

Note.—It is unlikely that the small patches of bronchopneumonia had any effect upon the liver. This is a typical case of acute chloroform poisoning (compare dog 32) in which hemorrhage is a striking feature.

Ligation of Hepatic Artery (Partial).

Dog 26, small mongrel, male pup, weight 12 pounds.

April 6. Operation (ether): ligation of hepatic artery. Ligatures 1 and 2 only were applied (see text figure).

April 10. Dog is well. Wound is clean.

April 23. Dog is fat and healthy. *Chloroform* anæsthesia 1½ *hours;* 0.5 *ounce* given. Anæsthetic taken poorly. Heart was quite irregular.

April 24. Dog seemed well and lively; no vomiting.

April 26. *Chloroform* anæsthesia 1½ *hours;* 0.5 *ounce.*

April 27. Dog appears bright and active. Killed (ether and bleeding from jugular). Pieces of liver saved in fixing fluids, and the aorta injected at once with the vermilion injection mass (see dog 37). After cooling on ice, dissection shows that there are two small arterioles opening from the concavity of the arch (see text figure), through which the injection mass entered the hepatic arteries. They were very small and could have supplied but little arterial blood to the liver. The viscera are quite normal except the liver.

Liver presents the usual appearance. It is very opaque, swollen, and yellow. The lobulation is conspicuous. Microscopically fat stain shows an unusual amount of large and small fat droplets throughout the central portions of the lobules, affecting at least three-fourths of the liver cells. The usual hyaline necrosis is found in the central half of the lobules. The liver cells about the portal spaces are normal in appearance. Other experiments in which the same results were obtained will not be added.

Summary.—It has been shown by Janson that ligature of the hepatic artery causes no appreciable change in the liver of the dog. Our experience confirms his findings. The lack of arterial blood has no influence upon the type of central necrosis produced by chloroform inhalation, nor has it any influence upon the regeneration of the liver following this injury.

Eck Fistulæ.

Through the kindness of Dr. Carl Voegtlin we were able to perform autopsies on two dogs with Eck fistulæ, the animals having been under observation for 10 to 11 weeks. Autopsies showed all the viscera to be normal in gross except the liver. Microscopical sections show nothing of interest except in the liver. The heart, lungs, spleen, pancreas, intestines, and kidneys were quite normal.

In one of the dogs the fistula between the portal vein and vena cava was quite small (4 x 6 mm.), and the ligature about the portal vein above the fistula was not effective, the opening admitting only the points of the scissors. In the other animal the fistula was quite large and the ligature of the portal vein was efficient.

The *livers* were practically the same in both cases. The organ is small, flabby, and rather tough. The lobules are small, presenting a brown, translucent edge and minute central yellow dot. Microscopically there is considerable atrophy and fatty degeneration of the central half of the liver lobule (Fig. 6). The animals used in the following chloroform experiments were operated upon by Dr. John Homans. We wish to thank him for his kindness in performing this difficult operation for us.

Dog 27, large brindle bull-dog, male, weight 32 pounds.

April 20. Operation (ether): Eck fistula established (Dr. Homans).

Dog made a good recovery. There was no vomiting. Wound slightly swollen.

April 23. Dog is well. In the afternoon *chloroform* anæsthesia 1 *hour;* 1 *ounce* given. Anæsthetic well taken and recovery rapid.

April 24-25. Dog active and well.

April 26. *Chloroform* anæsthesia 1½ *hours;* 1.2 *ounces* given. Anæsthetic taken well.

April 27. Animal appears normal.

April 29. Operation (ether): abdominal incision and removal of a wedge-shaped piece of liver.

Liver.—The gross appearance is not very abnormal. Microscopically fat stain shows many large fat droplets throughout the central three-fifths of the liver lobules. The marginal zone is free from fat and normal in all respects. Many of the central cells are shrunken, and some show complete hyaline necrosis. These necrotic cells are surrounded by phagocytes. There are many mitoses in the peripheral liver cells.

April 30. Dog is rather sick. Appetite is poor.

May 1-7. Slow improvement. There is some diarrhœa.

March 10-14. Considerable vomiting; gradual loss in weight; animal looks sick.

May 17. Animal losing weight and getting weaker. *Chloroform* anæsthesia 1½ *hours;* 1 *ounce* given. Anæsthetic well taken.

May 18. Animal killed (ether and bleeding from jugular).

Autopsy.—There are old adhesions about the site of the operation. Careful dissection of the portal structures shows that the fistula is efficient, and the ligature on the portal vein above the fistula completely closes the vein. The portal branches in the liver are greatly shrunken but contain fluid blood. The vena cava above the site of operation is somewhat thickened. *Heart* is quite normal. Sections show no fat. *Lungs*: both posterior lobes show large, deep red patches of bronchopneumonia, some of them measuring 4 x 2 x 1 cm. Microscopical sections show a bronchopneumonia in which there is a very little fibrin, but considerable œdema and many polymorphonuclear leucocytes and red blood cells. *Spleen* is perhaps a little increased in size. Microscopical sections show a good many polymorphonuclear leucocytes all through the pulp. The solitary follicles are normal. *Pancreas* is quite normal. *Kidneys* appear normal. The medullary rays are rather opaque. Sections show a good deal of fat in the straight tubules of the medullary rays. Stomach is normal.

Liver is small and quite pale. It is flabby and rather tough. Microscopically (Fig. 7) the central three-fifths of the lobules shows fatty degeneration and necrosis. The margin of the lobules shows normal liver cells. There are a good many phagocytes in the central area of necrosis, some of them containing granular, yellow pigment. The bile ducts are all normal.

Note.—In the sections at autopsy there is almost no evidence of the damage done to the liver by the chloroform administration (April 23), and evidently the repair was complete. Perhaps the large phagocytes containing yellow, granular pigment are the only remnants of this change (compare dogs 37 and 40 for details of this repair).

Dog 35, large, strong, brindle bull-dog, male, weight 35 pounds.

May 20. Operation (ether): Eck fistula established (Dr. Homans).

May 21-30. Dog doing well. Wound healing. No vomiting.

June 1. Operation (ether): abdominal incision and removal of a large wedge-shaped piece of liver for microscopical study. Wound partly closed, then *chloroform* anæsthesia started. Chloroform anæsthesia for 3 *hours;* 0.7 *ounce* only was given. Anæsthetic well taken. At the end of the chloroform administration a second piece of liver was removed for study. Abdominal wound closed.

Liver in gross appears small, deep red in color, and rather tough. Microscopical sections removed before and after administration of chloroform are exactly similar (Fig. 6). The liver lobules show considerable central atrophy of a very uniform type. There are a few small fat droplets in these central areas. There is no necrosis.

June 2. Dog rather weak but seems quite well otherwise. No vomiting. Killed in the afternoon (ether; bleeding from jugulars).

Autopsy.—The serous cavities are normal except for adhesions around the sites of the operation. Thorax, heart, lungs, pancreas, stomach, intestine are quite normal. Spleen is of normal size. Microscopically there is a good deal of yellow, granular pigment throughout the pulp. The *kidneys* are normal in gross. Section shows a little fat in the straight tubules of the medullary rays, and a few fine fat droplets in the convoluted tubules (distal).

Liver is small, rather pale, and tough. The lobules are quite small and show minute yellow central specks. Microscopically there are very small but quite definite hyaline central necroses of the usual type. Some of the lobules seem to escape. There are numerous wandering cells in the neighborhood of the necrotic cells. The liver cells in the centers show considerable fatty deposit. The peripheral half of the liver lobules is nearly normal. Possibly the small amount of chloroform given determines the small amount of necrosis found in this case. *Eck fistula*: the opening between the portal vein and the vena cava is quite large, measuring about 12 mm. in long diameter. The edges of this opening are rounded and smooth. Ligature on the portal vein above the anastomosis completely occludes the lumen. The portal branches in the liver are shrunken and contain fluid, deep red blood.

Note.—The findings in this experiment are similar to those observed in dog 27. The necrosis, though quite slight in amount, has the usual distribution. The specimen of liver removed before the administration of chloroform acts as an excellent control (Fig. 6) and shows that the establishment of an Eck fistula causes considerable central atrophy and fatty degeneration.

Summary.—Dogs with Eck fistulæ show no lesions of interest except in the liver. All the other organs are normal in gross and microscopically. The *liver* is diminished in size, of normal color, but rather tough. The stroma, bile ducts, and gall bladder are normal. In sections the liver lobules are seen to be decidedly smaller than normal (Fig. 6), and this change is due chiefly to a central atrophy and a little fatty degeneration. *Chloroform* anæsthesia gives a central necrosis of the usual type (Fig. 7), although the poison must have been carried to the liver by the arterial stream alone.

Chloroform Injected into Portal Vein.

Dog 23, small adult, male, weight about 18 pounds.

March 31. Operation (ether): abdominal incision, isolation of a small branch of the portal vein, and injection of 1 *cc.* of *chloroform* into this vein. Abdominal incision closed. The animal was quite drowsy for the next hour. There was considerable vomiting. In the afternoon the animal seems very ill and there are muscular twitchings and vomiting of bile-stained material.

April 1. Dog much improved; appetite is good. No vomiting.

April 2. Dog looks pretty sick. Killed at 5 p. m. (ether).

Autopsy.—All the serous surfaces are normal. Thorax, heart, lungs, spleen, pancreas, stomach, duodenum, and kidneys are quite normal in gross and in sections.

Liver.—The organ is pale and mottled with scattered areas of opacity, which are swollen, some of the larger ones measuring over 1 cm. in diameter. The tissue is quite opaque and outlined with a thin rim of hemorrhage. Where these areas touch on the capsule of the liver there are fibrinous adhesions overlying the surface. Elsewhere the liver lobules seem of normal size and show small central yellow dots. Microscopically (Fig. 11) there are extensive hyaline necroses scattered through most of the sections. Some of these are quite large, involving many lobules completely. Other lobules show only a thin rim of hyaline necrosis involving the tissue adjacent to the portal vein. In other areas are seen little round focal necroses involving only a few liver cells, but usually situated close to a portal vein and definitely in the periphery of the lobules. These areas of necrosis present the usual appearance and are full of various wandering cells. The centers of all the liver lobules show a little fatty degeneration, but fat is not present in the areas of necrosis.

Chloroform Injected into Hepatic Artery.

Dog 36, fox terrier, male, weight 15 pounds.

May 21. Operation (ether): abdominal incision. *Chloroform*, 1 *cc.*, injected into the hepatic artery about the location of ligatures 2 and 3 (compare text figure, dog 37). Some of this chloroform undoubtedly was carried to the duodenum and pancreas, but most of it into the liver. The wound was closed and animal recovered pretty rapidly.

May 22. Dog is drowsy and sick.

May 23. Dog is improving slowly, but seems rather dull. Dog killed at noon (ether).

Autopsy.—The serous cavities are all normal. There is some hemorrhage and œdema in the region of injection at the hilum of the liver. Heart, lungs, spleen, and kidneys are quite normal. *Stomach* and *duodenum* show numerous flame-shaped hemorrhages just below the serosa. The mucosa is swollen, deep red, and there is a thin rim of hemorrhage apparently in the submucosa. This process extends some distance down into the small intestine. There is no ulceration of the mucosa. Microscopically the rim of hemorrhage and necrosis is found to be not in the submucosa, but just at the base of the gland tubules of the mucosa. *Pancreas* is swollen and of a pinkish color. It is speckled with little fat necroses and small ecchymoses. Microscopically there are numerous focal, hyaline necroses of considerable size, involving several acini at a time. These areas of necrosis are especially numerous at the edge of the lobules. Polymorphonuclear leucocytes are particularly numerous at the edge of these necroses. Small fat necroses are usually associated with these areas.

Liver is soft and flabby, and a little bit diminished in size. The left lobes are much more involved than the right. The liver tissue here has a mottled appearance. The normal liver tissue contrasts with the areas of opacity, which are usually of small size and sharply marked out. Hemorrhage is not a striking feature. These lines and streaks of opacity appear to follow the larger portal structures, presenting a tree-like appearance in some sections. The right lobes are rather pale but translucent-looking, and the lobules are of normal size. There is evidently very little or no fatty degeneration here. Microscopically in some areas one sees massive necrosis involving several adjacent lobules completely. In some places are seen definite peripheral necroses involving liver cells adjoining portal spaces, but close to these same areas may be seen more numerous clean-cut central necroses involving about one-half of the liver lobule. A study of many sections shows that the areas of central necrosis are more numerous than those of peripheral necrosis. The areas of necrosis present the usual picture. Many of the dead liver cells have been in great part dissolved and replaced by wandering cells. The bile ducts show no abnormality. Fat stain shows no change of importance.

It will be seen that injection of chloroform into the portal vein can give rise to scattered areas of *peripheral* necrosis, while injection into the hepatic artery may cause not only *peripheral* necrosis, but *central* necrosis as well. The picture, however, in no way suggests that found in eclampsia, where we have evenly distributed and uniform *peripheral* necroses corresponding to the uniform *central* necroses produced by chloroform anæsthesia.

Is the Liver Necrosis Produced during or after Chloroform Anæsthesia?

Our experiments on this point are not conclusive.

Dog 39, small fox terrier, female, weight 15 pounds.

June 2. Operation (ether): removal of a wedge-shaped piece of liver. *Chloroform* anæsthesia was then begun and continued for 3 *hours;* 0.8 *ounce* given. At the end of this chloroform anæsthesia a second piece of liver was removed.

Liver appeared absolutely normal at the beginning and end of the chloroform anæsthesia. Microscopically both pieces of liver are normal. The protoplasm and nuclei of the liver cells in all parts of the lobule stain normally and similarly in the two specimens.

June 3. Dog appears well; animal given nothing but water. Operation (ether): the old wound is reopened and a third piece of liver is removed. The peritoneal cavity is normal.

Liver in gross has the usual appearance seen in chloroform necrosis. Microscopically the liver lobules show a central hyaline necrosis involving one-half of the parenchyma. The cell protoplasm as a rule is hyaline and bright pink-staining. Many of the nuclei show fragmentation, but the majority show extreme pyknosis. Some of the cells in the very center of the lobule seem to be pretty normal, and the nuclei are not much changed. Many leucocytes are present in the capillaries, particularly in the middle zone, where the nuclear fragmentation and hyaline change of the protoplasm is most marked.

June 4. Animal is rather sick. Killed at noon (ether), 44 hours after removal of control piece of liver, which was normal.

Autopsy.—All the viscera are normal except the liver. There are fresh adhesions around the abdominal incision.

Liver presents the usual picture. The lobulation is very clean cut. Microscopically the liver lobules show the usual uniform

complete central necrosis involving two-thirds of the lobule. All the liver cells in these areas have undergone complete hyaline necrosis, and there are large numbers of wandering cells in the central areas. There is a well-marked middle zone of fatty degeneration.

NOTE.—Compare with this experiment dog 40 (see below) and dog 35 (Eck fistula), in which similar experiments showed that the liver cells, as far as could be determined by the microscope, were normal at the end of a long chloroform anæsthesia. This finding suggests that the liver necrosis might be due to some metabolic products formed in the organism as a result of the chloroform anæsthesia.

This phenomenon may be explained in many ways, but not quite satisfactorily. Wells has advanced an ingenious and attractive hypothesis for this action of chloroform: That the drug inhibits the synthetic activity of the cell but not the activity of its enzymes, and the cell digests itself. He believes the oxidazes to be particularly involved. If the cell digestion is due to an inhibition of the cell activity effected by the chloroform, this autolysis must be active only during the administration of the drug and during that time must have completely destroyed the cell life. It is possible but perhaps improbable that this autodigestion could destroy the life of the cell without injuring any of its staining properties.

Longcope has made some interesting experiments on autolysis *in vitro* showing that blood serum inhibits autolysis of liver cells, but has reported no observations on the action of chloroform.

A second possible explanation of this delay in appearance of the liver necrosis is the following: The chloroform causes a true cell necrosis *in situ,* as may be illustrated by the action of alcohol or any fixing fluid on the surface of the liver. The inflammatory reaction occurs in a few hours, and the dead cells become hyaline-looking by absorption of the body fluids and a coagulative process.

Experiment (dog 39) shows that 20 hours after anæsthesia the liver cells show definite but not typical signs of hyaline necrosis. The necrotic areas show most extensive nuclear fragmentation and hyaline change in the *peripheral* portion, where the dead liver cells are in contact with the living and are being invaded by the wandering cells. The liver cells in the very centers of the lobules may appear almost normal under the microscope, yet we know they are dead, and during the next 24 hours they assume the usual hyaline, necrotic appearance. But if chloroform is injected directly into the portal vein it causes a necrosis which can be recognized by the microscope at the end of two hours (see following experiment, dog 15).

DOG 15, medium-sized mongrel, male.

March 2. Operation (ether): isolation of a small branch of the portal vein and injection into this vein of 6 *cc.* of *chloroform.* The animal was profoundly shocked and heart stopped beating. Massage through the diaphragm started the heart beating again. The dog lived for 2 hours after the injection of chloroform.

Autopsy.—The viscera are all negative. *Liver* presents a remarkable mottled appearance, grayish red, swollen areas alternating with darker purple, more normal-looking liver tissue. Microscopically fat stain shows nothing except a few fat droplets in the epithelium of the bile capillaries. There is a widespread destruction of the parenchyma in irregular patches, usually about the portal vessels. Here the liver cells look pink and glassy, and the nuclei are dull and pale-staining. The protoplasm is not hyaline, but takes more of the pink stain than normal. There is but very little cell reaction about these areas of necrosis.

NOTE.—In this experiment the liver cells were killed suddenly by the direct action of the chloroform, and such cells 2 hours after the action of the chemical show disappearance or a very faint staining of the nuclei. Such lesions after a duration of 24 hours (see dog 23) appear very like the hyaline central necroses produced by chloroform anæsthesia. The liver cells in both cases are hyaline, pink-staining, refractile, and surrounded by many wandering cells.

GENERAL DISCUSSION OF LIVER NECROSIS.

The above experiments show conclusively that the vascular supply of the lobule has no relation to the character and distribution of chloroform necrosis—a typical example of central liver necrosis. It is well known that central necrosis is common but mid-zonal and peripheral necroses are rare in human and animal pathology. We have found no record of experimental production of mid-zonal or peripheral necroses. How may we explain the apparent specificity of a poison like chloroform, which invariably exerts its harmful effects first on the very central cells, with a progressive involvement of the neighboring ones? There are many possibilities:

1. That the bile ducts drain off the harmful products and more effectually protect the margins of the lobules.

2. That the drug has a specific action on the central liver cells.

3. That the lack of arterial blood or the accumulation of waste products in the blood renders the cells supplied by this blood more susceptible to the poison.

4. That the activity of the poison determines its point of attack—all poisons are brought to the periphery of the lobule and the more powerful ones (for example, the eclamptic poison) may attack the cells first encountered.

There is no support for the view that the bile ducts drain the portal fraction more effectually and thus prevent peripheral necrosis. Dog 8 (see above), with complete obstruction of the common bile duct, presented the usual chloroform necrosis.

There is no very strong evidence for a true specific action of chloroform, for it will cause necrosis of the liver cells in the middle zone *after* the cells in the center have undergone necrosis. In fact by prolonged chloroform anæsthesia in animals we may kill practically every liver cell except a single row or two about the portal spaces (see dog 31, above, and the human case 2689, Figs. 1 and 12).

There are many points in favor of the view that the accumulation of waste products in the blood, as it flows from the edge to the center of the lobule, renders the central cells more prone to injury. But the finding of a thin peripheral zone of liver necrosis in eclampsia speaks strongly for either a selective action of the poison or a very powerful poison which acts *immediately* when brought in contact with the liver cells. We may imagine that the weaker or diluted poisons can injure only the central liver cells after prolonged action, as in a long chloroform anæsthesia.

It is possible that a *central* necrosis is determined by both these factors—namely a weak or diluted poison and a concentration of waste products in the center of the lobule.

III. Repair after Central Liver Necrosis.

When a liver is examined in which at least one-half of all the liver cells have been destroyed, that is, all the central cells have undergone hyaline necrosis, it seems obvious that the process of repair will lead to more or less scar formation, with consequent distortion of the liver architecture. Yet such is not the case, and the process of repair will bring the organ back to a normal condition after two to three weeks. It will be shown in cases which follow that after chloroform has been administered sufficient to cause necrosis of the central two-fifths or three-fifths of every liver lobule, the process of repair will begin at once, provided the animal recovers. The necrotic debris is removed by wandering cells or cell enzymes; the remaining liver cells multiply rapidly and replace a greater part of the deficit in six days (Fig. 9), effect almost complete repair in eleven days (Fig. 10), and after three weeks the liver seems quite normal, except perhaps for a few small nests of wandering cells about some of the efferent veins. The bile ducts take no part in this process, and it seems very unlikely that any such necrosis could be responsible for cirrhosis of the liver as seen in man. One observation may throw a little light on this matter. An animal (dog 13) had been given chloroform to produce liver necrosis, then operated upon under ether with removal of a wedge of liver for examination. The wound in the liver was closed with two cat-gut sutures, and the animal was allowed to live for several days. Microscopical sections removed at autopsy six days later showed extensive central necrosis in every lobule and the usual process of repair with no participation of the bile ducts, but around the liver sutures was a different picture. These sutures had caused massive necroses in the liver, due in part to pressure, and many liver lobules showed complete necrosis. Many of the *bile ducts* in such areas had not undergone necrosis, but were sending out buds and sprouts into the nearby tissue, giving a picture very suggestive of an early cirrhosis. As shown above it is possible to cause scattered areas of massive necrosis in the liver by injection of chloroform into the portal vein. Animals in which this has been done repeatedly are under observation to determine whether a true cirrhosis can be produced in this manner.

Repair after Chloroform Necrosis—Eleven Days.

Dog 40, mongrel, male pup, weight 21 pounds.

June 7. Operation (ether): abdominal incision and removal of wedge-shaped piece of liver. The anæsthetic was then changed and *chloroform* given for 2 *hours and* 50 *minutes;* 1 *ounce* given. At the end of this anæsthesia a second piece of liver was removed, and the abdominal incision closed as usual.

Liver before and after anæsthesia is quite normal in gross. Microscopically the pieces removed before and after anæsthesia are exactly similar and quite normal. Fat stain showed a few very fine fat droplets in the cell protoplasm, and a good many fat droplets in the epithelium of the bile ducts. This is a condition normally present in healthy animals.

June 8. Animal is well and active. Operation (ether): the old surgical incision was reopened and a third piece of liver removed. Liver in gross presents the usual picture found in chloroform poisoning. It is swollen, friable, and the lobulation very conspicuous. Microscopically each liver lobule shows a central hyaline necrosis involving about three-fifths of the parenchyma (Fig. 8). There has been invasion by numbers of wandering cells. There is a very conspicuous zone of fatty degeneration between the areas of necrosis and the margin of well-preserved liver cells about the portal spaces. There are no mitoses found.

June 10. Animal seems pretty well. The wound is œdematous. Takes food without vomiting.

June 12. Dog is recovering rapidly and eats well.

June 19. Dog is active and perfectly well. Killed (ether).

Autopsy.—Animal is very well nourished. The serous cavities and viscera are all normal in gross. The stomach is full of food. There are old adhesions about the operation scars. Microscopical sections show nothing of interest except in the liver.

Liver appears normal in gross except for scars and adhesions at sites of operation. The lobules are very distinct and of normal size. The center shows a slight congestion, and the periphery has the usual translucent, brownish red appearance. The consistency is normal. The gall bladder and ducts are normal. Microscopically (Fig. 10) the repair is almost complete. Many of the lobules are quite normal. Some of them show some abnormalities in their very centers. Here the liver reticulum is a little conspicuous and has not been filled in by the proliferating liver cells. The chinks in this reticulum are filled by mononuclear wandering cells and little grains of yellow granular pigment. There are no evidences of any new formation of connective tissue in this region. Here and there in some of the lobules are found little nests of mononuclear cells, but these are few in number and of small size, never occupying a space larger than that occupied by four or five normal liver cells. The bile ducts are normal and the architecture is quite uniform.

Note.—Compare these experiments with dog 37, in which the hepatic artery had been cut off from the arterial tree, yet the repair after the same interval was practically the same in the two animals (Fig. 5). It is remarkable that the remaining liver cells (the peripheral one-fourth) which are not damaged by the chloroform are able to multiply rapidly and repair the liver completely in a space of 11 days.

Repair after Chloroform Necrosis—Six Days.

Dog 13, fox terrier, male.

February 16. *Chloroform* anæsthesia 2½ *hours;* 2.5 *ounces* given.

February 17. *Chloroform* anæsthesia 2½ *hours;* 2.5 *ounces* given. There was considerable vomiting during the night.

February 18. Dog is not feeling well, and there is some vomiting. Operation (ether): abdominal incision and removal of a wedge-shaped piece of liver.

Liver presents the usual picture in gross. Microscopical section shows an extensive central necrosis involving about three-fifths of the liver lobule. This necrosis is of the usual hyaline type, with invasion by many wandering cells. There are a few mitoses in the peripheral liver cells about the portal spaces.

February 19-20. Dog is quite sick and drowsy. Considerable vomiting.

February 21-23. Dog improving rapidly.

February 24. Dog seems well. Animal killed (ether).

Autopsy.—The serous surfaces, thorax, heart, lungs, and spleen are all normal. *Kidneys*: cortex is rather opaque and swollen. Pancreas and intestine are normal.

Liver is of rather small size. The color is a pale yellowish brown. The lobulation is quite regular. The centers of the lobules are rather conspicuous and contain blood. Microscopically (Fig. 9) the peripheral zone of normal liver cells has about doubled in thickness, filling up the greater part of the liver lobules, but the central fifth of each lobule shows a delicate reticulum apparently uninjured by the process of necrosis and repair. The necrotic liver cells have undergone almost complete solution

and disappearance. The loose central reticulum contains a good many large mononuclear wandering cells and a few small grains of yellow pigment. A few of the liver cells contain fat droplets, but the great majority of the liver cells appear normal. Only a few mitoses can be found. Bile ducts are quite normal. Sections made through the healing wound in the liver show the interesting picture above described. About the cat-gut sutures there has been a massive necrosis involving many lobules, and the bile ducts in such areas show beginning proliferation and branching, suggesting the picture seen in cirrhosis of the liver.

NOTE.—By comparing this experiment with the preceding one, it is seen that the repair takes place by a multiplication of the liver cells, thus causing an elongation of the cords of liver cells. This brings about a gradual filling in of the centers of the damaged lobules, the liver cells being pushed in from the marginal zone. There is no connective tissue reaction in such areas, although the large mononuclear cells as well as the polymorphonuclear cells are quite numerous. *The bile ducts do not seem to take part in this process, unless the necrosis has affected all the liver cells of the adjacent liver lobules.*

REPAIR AFTER CHLOROFORM NECROSIS—EIGHTEEN DAYS.

Dog 33, small mongrel, male, weight 16 pounds.

May 7. *Chloroform* anæsthesia 1½ *hours;* 0.6 *ounce* given. Anæsthetic well taken.

May 9. *Chloroform* anæsthesia 1 *hour and* 45 *minutes;* 0.7 *ounce* given.

May 10. The dog looks quite sick. Operation (ether): abdominal incision and removal of a wedge-shaped piece of liver.

The *liver* in gross looks large, swollen, and yellowish. The lobules are large, yellow and opaque. Microscopically there is the usual central necrosis involving one-third of the liver lobule. The liver cells are hyaline in appearance, and surrounded by many wandering cells. The middle zone contains a large amount of fat. There are many mitoses in the well-preserved liver cells.

May 11. Dog is recovering slowly; no vomiting.

May 13. Wound is breaking down, but animal is improving rapidly.

May 16. Dog is quite lively. The wound is granulating.

May 28. Dog is quite well and fat. Operation (ether): removal of piece of liver.

Liver appears quite normal in gross. Microscopically the liver is practically normal and the repair complete. Some of the lobules show a few mononuclear cells in the very centers. Some phagocytes contain a few grains of yellow pigment, and there may be a few polymorphonuclear leucocytes in these areas. The architecture of the liver is quite uniform and regular. The liver cells are normal. Bile ducts are normal.

REPAIR OF LIVER FOLLOWED BY SECOND CHLOROFORM NECROSIS.

Dog 28, mongrel, female, weight 18 pounds. The dog is very strong and active.

April 21. *Chloroform* anæsthesia 1 *hour and* 45 *minutes;* 1 *ounce* given.

April 22. Dog is quite well, no vomiting; *chloroform* anæsthesia 2 *hours;* 2 *ounces* given. Anæsthetic well taken.

April 23. No vomiting, but animal is not very active. *Chloroform* anæsthesia 1 *hour and* 20 *minutes;* 1.5 *ounces* given.

April 24. Operation (ether): abdominal incision and removal of a wedge-shaped piece of liver.

The *liver* in gross presents the usual picture of chloroform necrosis. Microscopically the liver lobules show extensive necrosis and solution of the liver cells involving about one-half of each lobule. There are many hyaline necrotic liver cells surrounded by mononuclear and polymorphonuclear wandering cells, but the greater part of the dead liver cells has been removed, leaving a rather conspicuous reticulum and capillary network which contain many wandering cells. The peripheral cells of the lobules show extreme fatty change. Mitoses are not very numerous.

April 25-26. Dog recovered very rapidly and seems quite normal.

May 10. Operation (ether): removal of a large piece of liver (16 *days after the first operation*). The animal is fat and all the viscera look normal.

Liver.—Microscopically there has been practically complete repair of the liver necrosis. The lobules are of normal size and general appearance. In the very center of the lobule may be seen a few round cells and a little condensation or thickening of the reticulum. A few of the liver cells in the centers of the lobule show a few fat droplets. Here and there throughout the lobules are found small foci of mononuclear cells.

May 11. Dog completely recovered.

May 22. *Chloroform* anæsthesia 2 *hours;* 0.7 *ounce* given.

May 23. *Chloroform* anæsthesia 1¼ *hours;* 0.6 *ounce* given. Anæsthetic taken well and animal appears lively.

May 24. Operation (ether): abdominal incision for removal of a piece of liver. The animal bled very easily, and the hemorrhage could not be controlled. Animal died 1 hour later.

Autopsy.—Dog is very fat. The edges of the wound show a hemorrhagic œdema. The abdominal cavity contains about 300 cc. of fluid blood. There are old adhesions around the scars of former operations on the liver. Thorax, heart, and lungs are normal in gross. Microscopical sections of *heart* show a little fragmentation of the heart muscle and a very diffuse infiltration with very fine fat droplets. Thymus is normal in gross and in sections. Spleen, pancreas, stomach, and intestines are normal. *Kidneys*: the cortex is pale, and the medullary rays are conspicuous. Microscopically the straight tubules in the medullary rays contain a great deal of fat. The glomeruli, convoluted tubules, and stroma are normal.

Liver is large, pale, and fatty-looking. The cut section is quite uniform. The lobules are conspicuous, with red center and an opaque, yellow peripheral zone. The organ is quite friable. Microscopically the liver lobules show a hyaline central necrosis involving about three-fifths of each lobule. This necrosis is of the usual type. The middle zone contains a large amount of fat, and the peripheral zone of liver cells is about normal. There are a few mitoses here. A few of the lobules in their central portions show a thickened reticulum, which may contain a compact mass of mononuclear cells and a little yellow granular pigment. This is all the evidence to be found indicating the primary necrosis and repair which can be followed above in the sections. The new-formed liver cells are evidently as susceptible to the chloroform as the original liver cells. The bile ducts are quite normal in all sections.

NOTE.—*This animal shows a primary central necrosis of about one-half of the liver lobule which is almost completely repaired during the following* 16 *days. A second administration of chloroform gives a similar picture. The animal appears to be slightly more susceptible. At autopsy one can find scarcely any indication of the primary chloroform necrosis, which had been produced just one month previously.*

Summary.—The process of repair in the liver lobule after an extensive chloroform necrosis may be outlined about as follows: The hyaline masses of liver cells appear quite intact and homogeneous, staining a bright pink with eosin, for 24 to 48 hours. Many wandering cells come into these areas, and the necrotic cells are rapidly dissolved and removed in great part in the next 36 to 48 hours. The mononuclear cells now predominate and may be actively phagocytic. The liver cells

show mitoses after the first 24 to 36 hours, if the animal recovers, and the mitotic figures are very numerous at the end of the second day. The columns of liver cells elongate by cell division, and fill up the empty spaces left in the reticulum by the digestion and removal of the dead liver cells. Following an extensive injury (one-half to three-fifths of each liver lobule) the repair is more than half completed in six days (Fig. 9), almost complete in eleven days (Fig. 10), and quite complete in three weeks. Such necrosis and repair does not lead to any cirrhosis.

IV. Chloroform Poisoning in Man.

This subject has been of great interest to surgeons, especially in the German hospitals, and has called out many contributions to the recent literature. The clinical picture is well known and an abstract of a typical case is given below. Comparison with the cases of chloroform poisoning in dogs shows that the processes are identical. Animals vary greatly in their susceptibility to this drug given by inhalation, and it is evident that the same rule holds for human beings. There is no known way of estimating this susceptibility in animals nor in human beings, though one can say that the amount of liver necrosis, as a rule, varies directly with the length and depth of anæsthesia and the amount of chloroform administered. Young animals are found to be more susceptible than adults. It is worthy of emphasis that the fatal case recorded below followed a minor surgical operation in which the chloroform anæsthesia lasted only 35 minutes.

Delayed Chloroform Poisoning.

D. C., female, negress, age 19 years. Surgical No. 18860.

Only a short abstract of the clinical history will be given. The patient came in because of swelling in the right axilla. Family history negative. Past history unimportant. Habits are good. The year before admission she began to have a little fever, headache, and loss of appetite. September, 1905, operation for tuberculous glands in the neck. March 5, 1906, admitted to the hospital. The lump in the right axilla has been growing slowly for the past three months. Some time ago it ruptured, and there has been a discharge for some time. There is some swelling of the right breast. Physical examination is of no particular interest and shows evidence of a tuberculous process in the right side of the neck and in the right axilla. Thorax and abdomen are quite normal. Sputum is negative for tubercle bacilli. Temperature before operation showed a daily afternoon rise to 102° or 103° F. Urine is normal.

March 10. Operation: incision and drainage of abscesses of chest wall and right axilla (Dr. Watts). *Chloroform 35 minutes.* Patient stood the operation very well and recovery from the anæsthetic was rapid. She vomited several times that night. Temperature 99.8° F.

March 11. In the morning the patient vomited dark fluid. In the afternoon when given food she immediately vomited again. The patient complained of some cramplike pains over the upper portion of the abdomen. She was quiet and rational, but did not sleep.

March 12. In the morning some muscular tremors in arms and legs were noticed. The patient is talking a good deal and is irrational at times. Vomiting continues. Vomitus is clear or slightly bile-stained fluid. Later in the day she became noisy and had to be restrained. Slight jaundice of the sclerotics noted. Urine quite normal.

March 13. The patient is irrational at times and very restless. Pulse became rather weak and respiration irregular. Jaundice is very definite in sclerotics. The patient had short convulsive attacks about 10 a. m. She became comatose as the day advanced. Respirations became more labored and rapid. Pulse became more rapid and weaker, 110 to 130 per minute. Temperature subnormal. The patient died at 6.40 p. m. *Urine* on day of death showed a trace of albumin. No sediment—a few hyaline casts. There is no acetone. Leucine and tyrosin are present in considerable amounts (Dr. Wiel).

Autopsy No. 2689. 10 a. m., March 14, Dr. Whipple.

Clinical Diagnosis.—Acute intoxication; chloroform poisoning.

Anatomical Diagnosis.—Extreme central necrosis of liver; fatty degeneration of kidneys and heart; subserous and pulmonary petechial hemorrhages; icterus; acute bronchitis; bronchopneumonia; general tuberculous lymphadenitis; tuberculous peritonitis; operation wounds.

Only that part of the autopsy protocol will be recorded which is of particular interest in relation to chloroform poisoning.

Body is that of a well-built, well-nourished colored female, 164 cm. in length. Rigor mortis is present. The sclerotics show a deep yellow jaundice tint. The pupils are equal. There are surgical incisions on the right side of the neck and in the right axilla. The peritoneal cavity is clear. The organs are normally disposed. The retroperitoneal fat is dotted over with little ecchymotic spots, some of them measuring 3 mm. in diameter. The pleural and pericardial cavities are clear.

Heart weighs 250 gm. The epicardial fat is well preserved. The chambers are dilated. The heart muscle is very pale, and has a yellowish color. All the valves are delicate, and the intima is smooth. The wall of the left ventricle averages 15 mm. in thickness. Tangential section shows a pale, uniform, yellowish brown heart muscle. There are a few minute ecchymoses below the endocardium of the left ventricle. Microscopically there is no increase in connective tissue. The muscle cells show fragmentation and fatty degeneration.

Lungs.—The pleural surfaces are smooth. The bronchi show a swollen purple mucosa. Some of the bronchial lymph glands show caseous foci. The cut section is moist, deep pink in color, mottled with irregular, purplish areas of small size not over 1 cm. in diameter. Microscopically many of the alveoli contain fresh blood and some an exudate of polymorphonuclear leucocytes and little fibrin. The blood, which is well preserved, is the striking feature of the section. *Stomach* contains a black granular material and fluid. Its mucosa is pale and smooth. *Duodenum* and *intestines* are negative, except for a few small tuberculous ulcers in the ileum. The *pancreas* is normal. Spleen, mesenteric glands, pelvic organs, brain and neck organs show nothing of importance.

Kidneys weigh 420 gm. The left kidney measures 11 x 7 x 4½ cm. The capsule comes off easily, leaving a pale, smooth surface. The cut section shows a cortex averaging 9 mm. in thickness. The striæ are quite straight. The tubular portion of the cortex is opaque and yellow. The glomeruli are visible as minute red dots. The pyramids are normal. There are a few ecchymoses in the pelvic fat. The right kidney is of similar description. Microscopically there is no nephritis. The glomeruli are normal. The convoluted tubules show a very definite fatty degeneration, and some of the epithelial cells have undergone necrosis. All of the epithelium of the convoluted tubules stains faintly. The capillaries are congested. The straight tubules show much less change.

Liver measures 25 x 17 x 8 cm. It is not enlarged. The cut section has a uniform appearance. The lobules are very conspicuous. The centers are deep red, and the margins are very

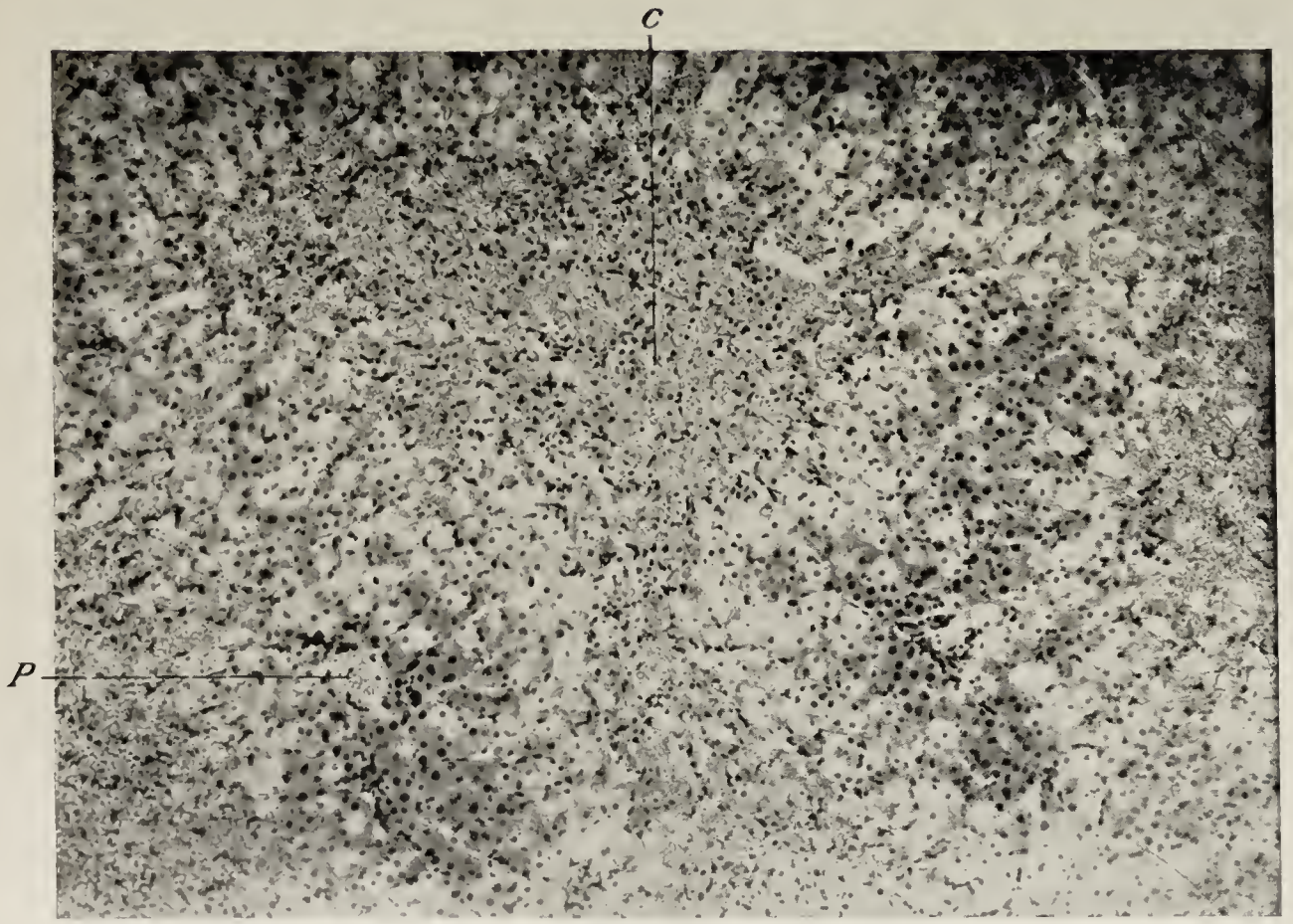


FIG. 1.—Central necrosis (chloroform) in pregnancy (dog 31). All liver cells necrotic except a row or two about the portal vein (*P*); center of lobule (*C*); a thin middle zone of fat can be seen.

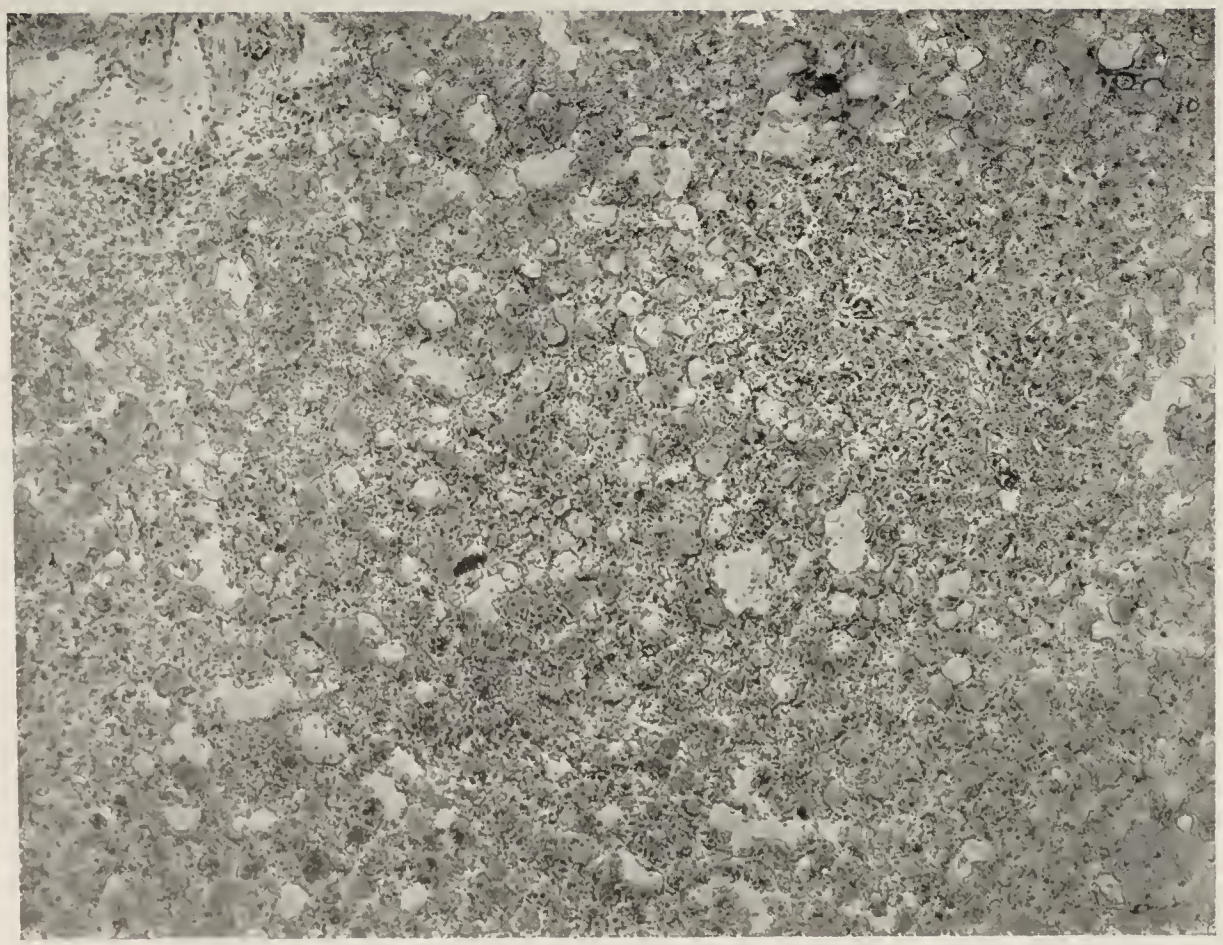


FIG. 2.—Central necrosis and extreme fatty degeneration (dog B). Chloroform anæsthesia for two hours.

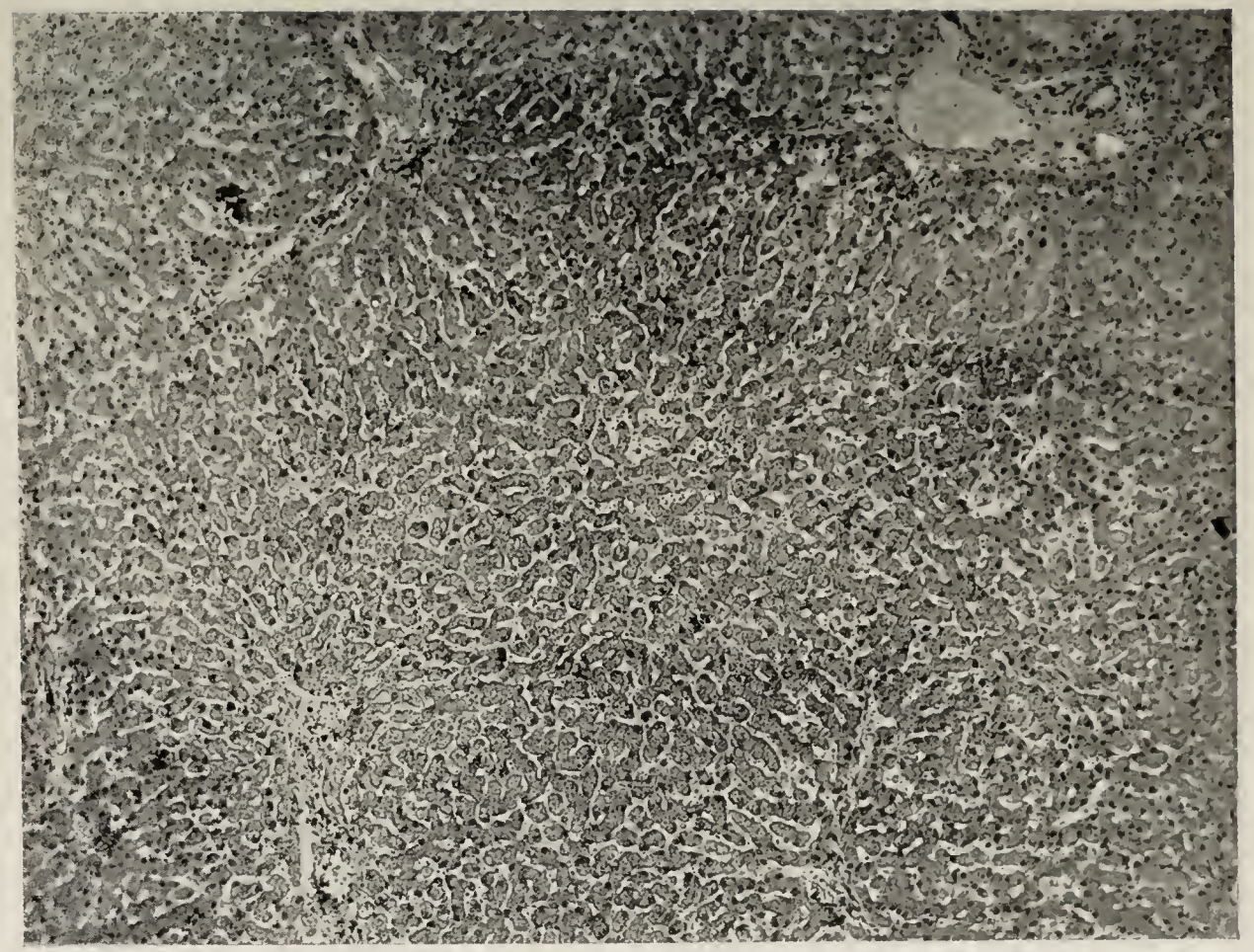


FIG. 3.—Ligation of hepatic artery (dog 38). Liver normal.



FIG. 4.—Ligation of hepatic artery (dog 37). Central necrosis (chloroform) of usual type; (*P*) portal vein; (*C*) central vein.

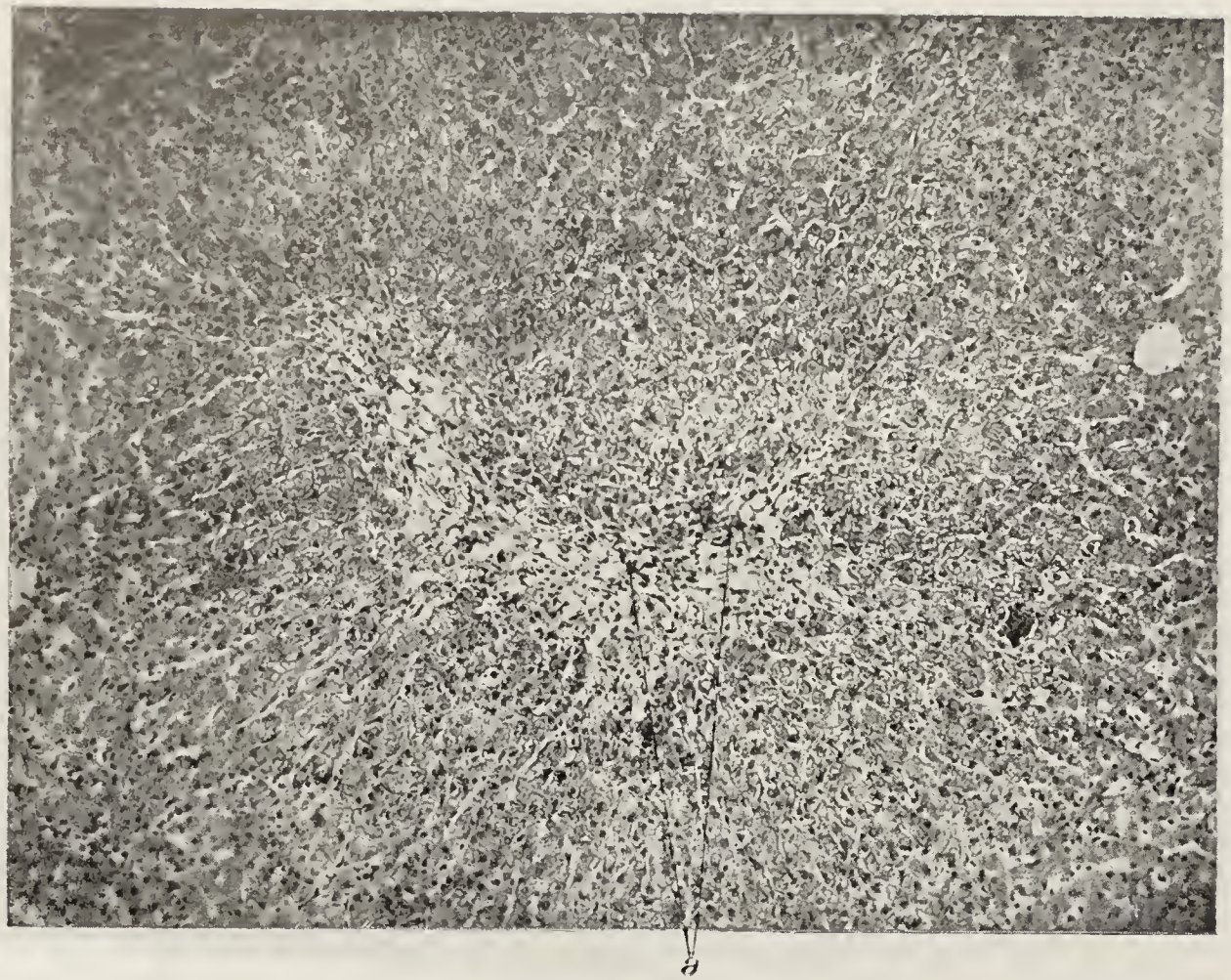


FIG. 5.—Ligation of hepatic artery (dog 37). Repair after central necrosis (eleven days); (*a*) nests of mononuclears, round, small hyaline debris.



FIG. 7.—Eck fistula (dog 27). Central necrosis (chloroform) of usual type.

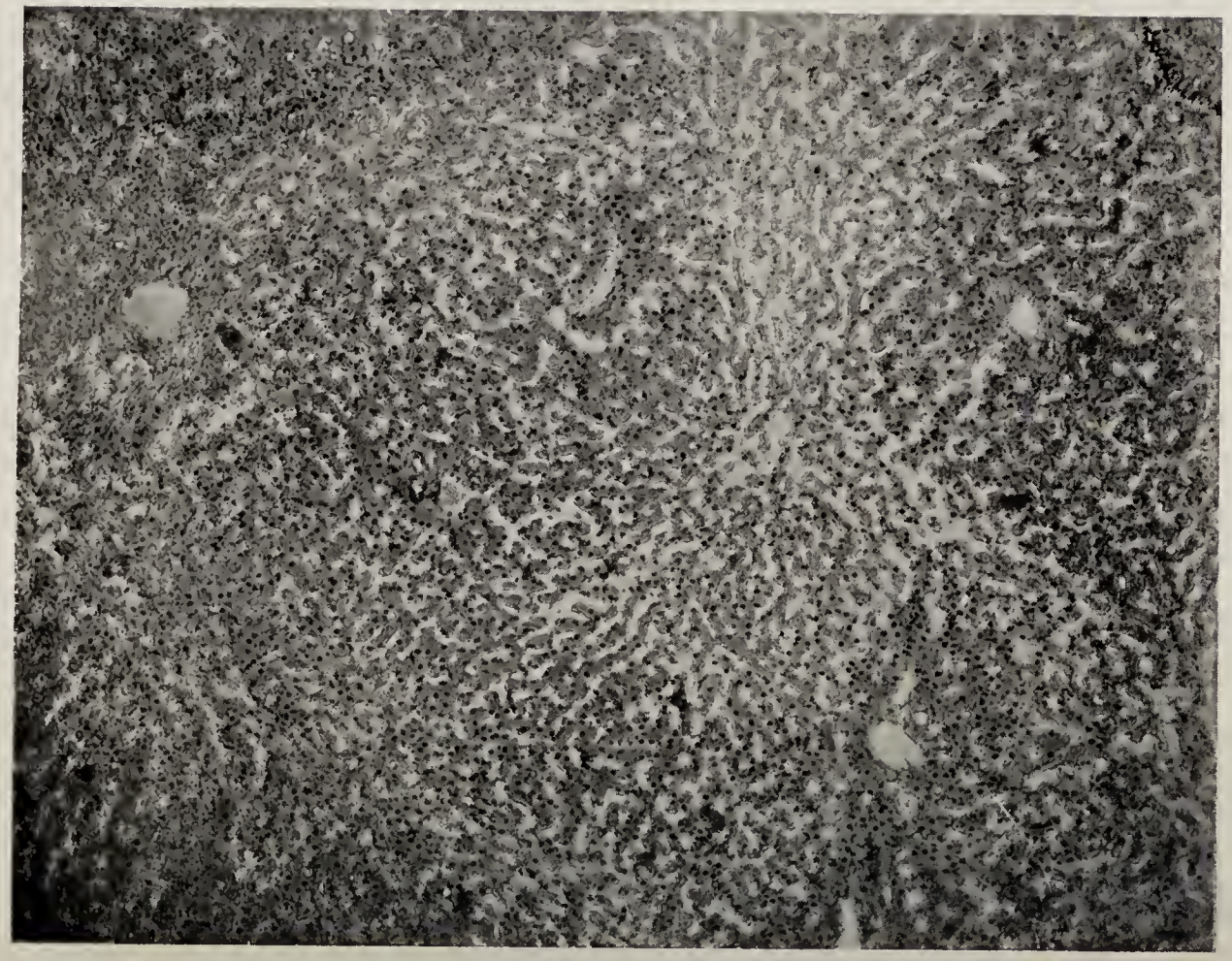


FIG. 6.—Eck fistula (dog 35). Central atrophy is evident.

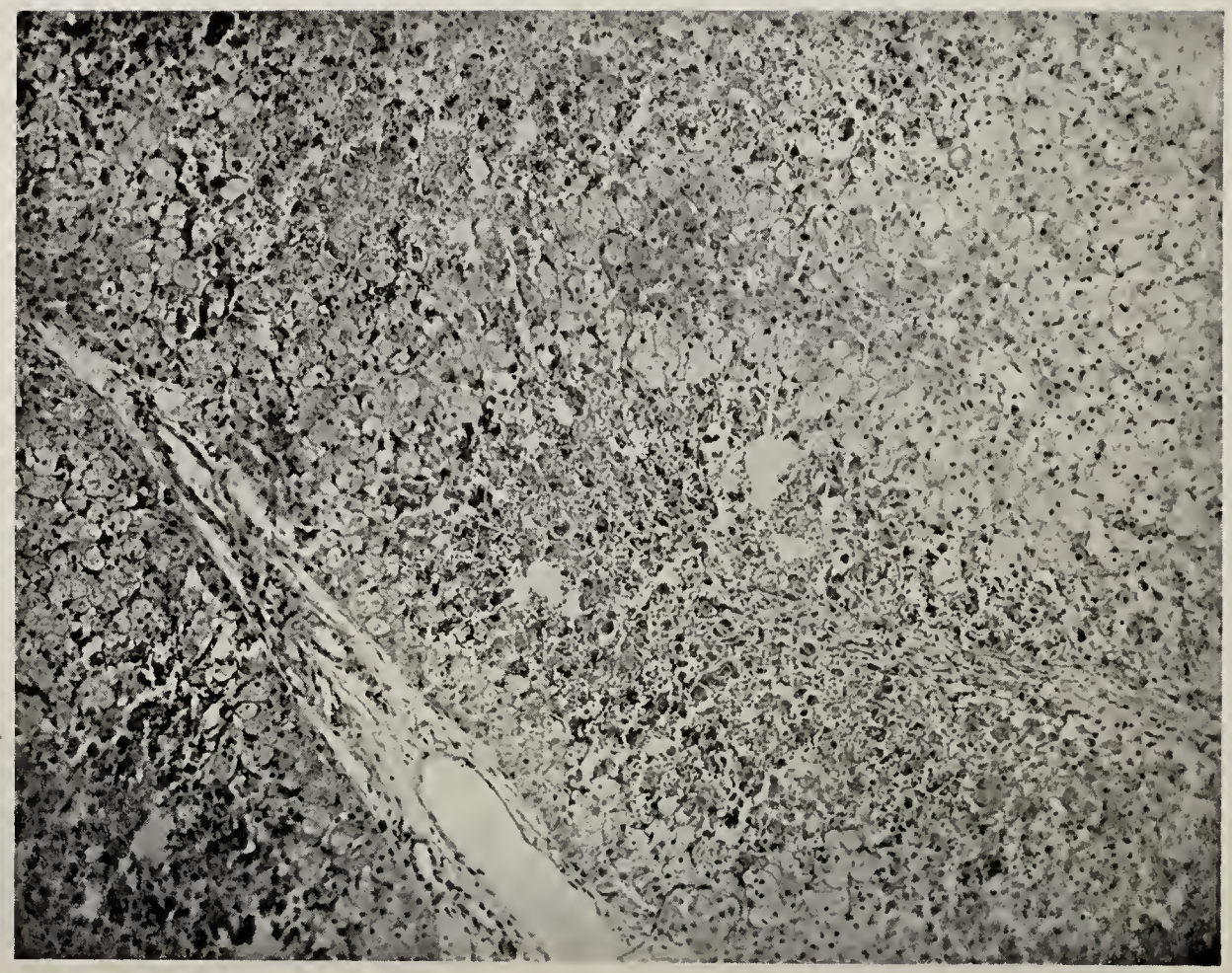


FIG. 8.—Central necrosis (dog 40). Chloroform for three hours. Fatty mid-zone is conspicuous; central three-fifths is necrotic.



FIG. 9.—Repair at end of six days (dog 13). More than half the damage has been repaired. Empty central reticulum (*C*) left by removal of dead liver cells.



FIG. 11.—Peripheral necrosis (*P*) due to chloroform injection in portal vein (dog 23).

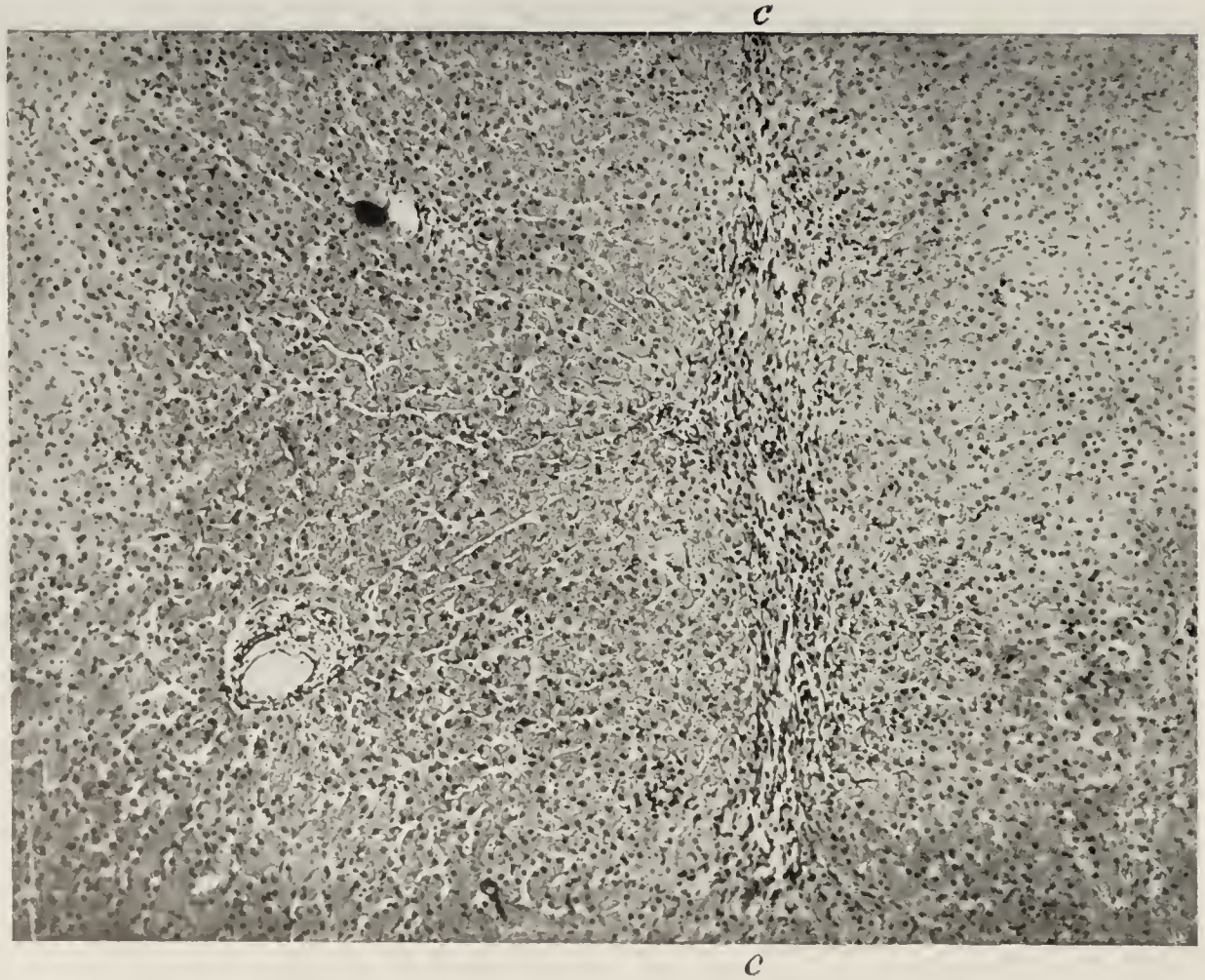


FIG. 10.—Repair at end of eleven days (dog 40). Healing of necrosis seen in Fig. 8 almost complete; many mononuclears in meshes of central reticulum (*C*).

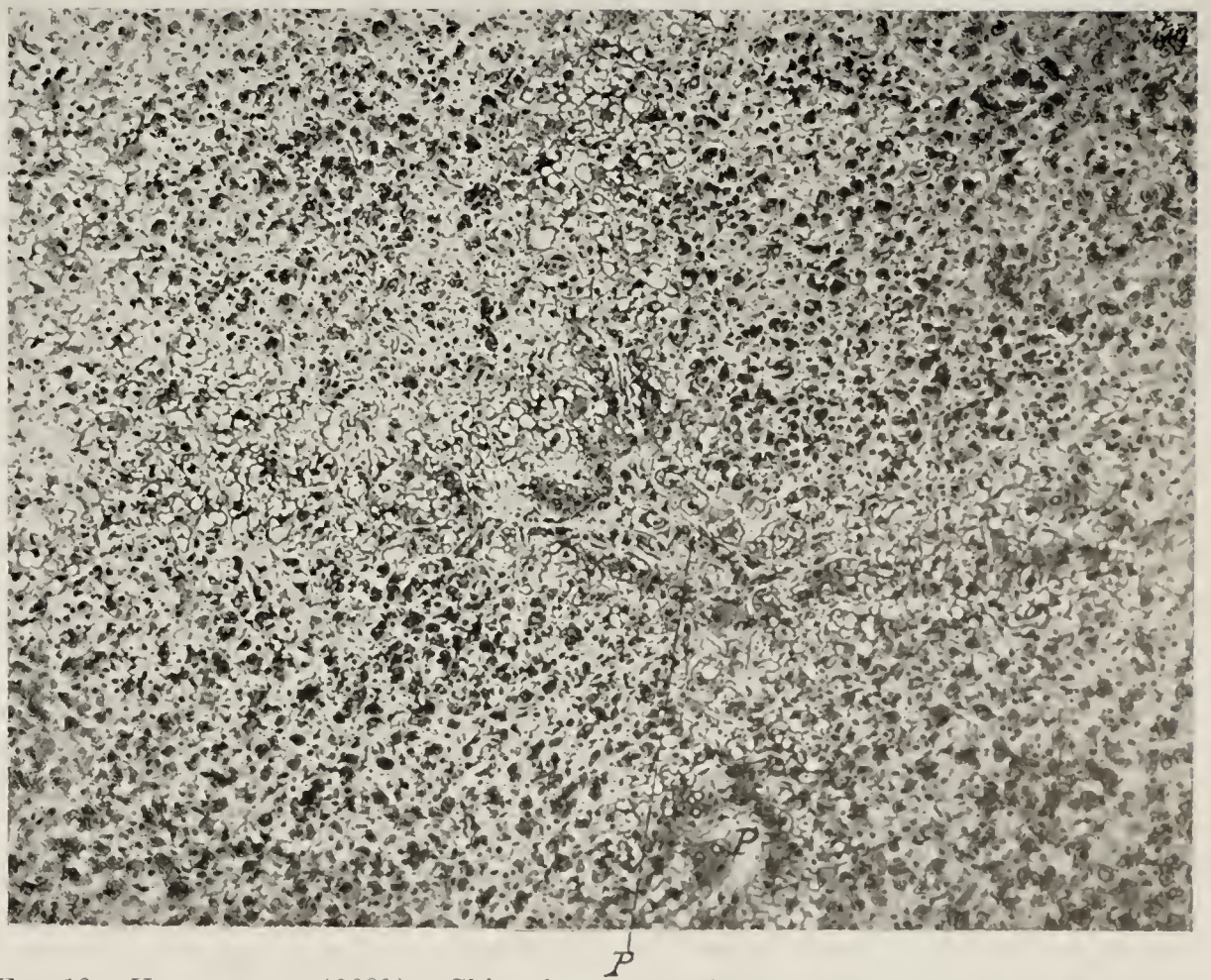


FIG. 12.—Human case (2689). Chloroform necrosis involving all but a single layer of liver cells round portal veins (*P*).

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thin, sharply outlined and of a yellowish color. The consistence is rather friable. The gall bladder contains a greenish fluid bile. Its mucosa is normal. Microscopically every liver lobule shows almost complete necrosis, involving the central portions and all the liver cells except a single row about the portal spaces (Fig. 12). The remaining liver cells about the portal spaces show advanced fatty degeneration and a few mitotic figures. The areas of necrosis show complete hyaline transformation of the liver cells and invasion by the usual wandering cells (polymorphonuclear and mononuclear). There has been as yet but little solution of the hyaline material. The gall ducts are quite normal. It seems that this is a condition of acute yellow atrophy in which the etiology is clear.

General Summary.

1. Chloroform is a poison and when given to produce anæsthesia will cause more or less damage to the liver. This is true for man and animals.

2. Chloroform anæsthesia for a period of one to two hours invariably causes some central liver necrosis, and may cause a fatal result in dogs.

3. Animals vary widely in their suseeptibility to this drug. Young animals as a rule are more susceptible than adults.

4. Chloroform anæsthesia for 35 minutes may cause fatal poisoning in man with almost complete liver necrosis (Fig. 12).

5. The pathology of chloroform poisoning is identical in dogs and in man.

6. The essential change is an extensive necrosis and fatty degeneration of the liver (Fig. 2). There may be numerous ecchymoses and hemorrhages into the peritoneum or upper intestinal tract. The pancreas may show many fat necroses and ecchymoses. The kidney and heart may present a moderate grade of fatty degeneration.

7. *Pregnancy* is no protection against the poisonous action of chloroform anæsthesia. Chloroform narcosis in pregnancy may cause extreme liver necrosis (Fig. 1) and placental necrosis with separation and hemorrhage. The fetuses may show no liver necrosis.

8. Central necrosis due to chloroform is uninfluenced by the blood supply of the lobule. This necrosis is the same whether the hepatic artery is ligated (Fig. 4) or the portal blood excluded by means of an Eck fistula (Fig. 7).

9. Ligation of the hepatic artery causes no change in the normal dog (Fig. 3).

10. An Eck fistula produces a diffuse atrophy and little fatty degeneration, affecting principally the centers of the liver lobules (Fig. 6).

11. Chloroform injected into the portal vein will cause scattered necroses, many of which are peripheral (Fig. 11).

12. Chloroform injected into the hepatic artery will cause necroses of the same type, both peripheral and central, the latter predominating.

13. The liver necrosis becomes visible to the microscope only after six to ten hours. The explanation for this is not clear.

14. If an animal recovers from the chloroform poisoning, the *repair* takes place rapidly and brings the liver back to normal in two to three weeks.

15. Repair is effected by solution of the necrotic liver cells and rapid multiplication of the remaining peripheral cells.

16. Repair goes on normally in a liver which is shut out from the arterial stream (Fig. 5).

17. Cirrhosis does not follow extensive central necrosis and repair (Figs. 8 and 10).

In conclusion it is our privilege to express our sincere thanks to the many men who aided us in this work: Drs. Homans and Voegtlin for the Eck fistula material, Dr. Parsons for assistance in operations, and Dr. Winternitz and Mr. Broedel for great assistance with the illustrations.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

April 19, 1909.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Frank R. Smith, the president, in the chair.

I. The Wassermann Reaction in the Diagnosis of Syphilis. Dr. P. W. Clough.

This paper will be published in the Bulletin.

II. Diet in Typhoid Fever. Dr. S. Strouse.

Dr. Strouse drew attention to the importance of the diet in such a disease as typhoid fever, where no specific therapy exists. The feature common to all cases of typhoid fever is the fact that the course of the illness is a long drawn-out battle between the patient and the disease. It is evident that the therapeutic goal should be the strengthening of the patient to the full limit of good, without harming him. This is adopted in such diseases as tuberculosis and septicæmia. Starvation in itself is a disease with various symptoms due to disturbed metabolic processes, and if Ewing's work is correct most of the symptoms of typhoid fever are caused by somewhat similar metabolic changes.

Food at once must be considered the main weapon, and a diet should be provided with sufficient nutrition, remember-

ing the handicaps under which the patient fights. Milk, which contains all the elements of a proper food in convenient form, has long been considered the ideal diet. And yet on milk diet the loss of weight has been striking. It is estimated to amount to from 200 to 600 grams daily, made up of water, fat, and the protein of the body tissues. It is known that by artificially raising the body temperature an increase of protein metabolism occurs, but an increase in the diet will decrease protein destruction even in fever. The reason for the ordinary typhoid diet not preventing this emaciation is clear. The ordinary individual in fever expends 2800 calories per day. 1500 to 2000 cc. of milk a day supplies only 1000 to 1400 calories. The deficit in energy supplied by the food will be made up by burning the body tissues.

It is almost a traditional belief that milk and other liquids are the most easily digested and absorbed. But experiments show that absorption of the most easily digested foods including milk is 5 to 10 per cent less than in a normal individual. Further, such food as egg or meat reaches the inflamed Peyer's patches in more liquid form than milk, which enters the cardiac orifice of the stomach a liquid and leaves the pylorus a solid.

But the proof of the diet is the eating, and the actual results are the final test. The papers of Shattuck, Thayer, Litchfield, and Kinnicutt in this country call attention to these results. A comparison of 98 cases on liberal diet and 149 on liquid diet at the Johns Hopkins Hospital is in favor of the freer diet. The death rate is lower, and the incidence of hæmorrhage and perforation less. As relating to the digestibility of the respective diets, it is interesting to note that abdominal pain, nausea, vomiting, and distention are present to a less degree. The total length of the illness is shorter and the convalescence almost two days less on the average. The convalescence is less formidable: the necessary increase in diet is a far easier task; and the patient is much more comfortable. Such a liberal diet has been tested sufficiently to warrant the conclusions not only that it is not harmful, but that it offers distinct advantages over the low diet.

While details of diet cannot be prescribed by dogmatic rules, the underlying principle in feeding typhoid fever patients should be to furnish at least the same amount of food energy required by a healthy resting person.

Discussion.

Dr. W. S. Thayer.—He pointed out the difficulty in taking the other side of this question. As much nourishment should be given as the patient can take, in order to keep up the strength and prevent the loss of body weight. One cannot help feeling that the individual resistance against complications and sequellæ toward the end of an attack is much better in the well-fed, fatter, and less anemic individuals. These prineiples are well recognized everywhere except in the United States. The remarkable conservatism in American hospitals is strange. The reason is largely because it has been routine for so long. The general profession have accepted it without question. The country practitioner is the wiser and has the better results. He cannot feed his patients according to any rule. In some preliminary work Dr. Voegtlen showed that the loss of nitrogen to the body could be prevented absolutely by increasing the carbohydrate intake.

The reasons commonly given for not feeding are that it increases the intoxication and makes grave intestinal complications more likely. The statistics of the Russian army surgeon who fed his patients ordinary ward diet show that convalescence is shorter, the patients get up sooner, and are not so thin.

It is quite irrational to consider that there is any danger in feeding a typhoid patient. Experiment has shown there is no danger. Of course, it is unwise to overfeed any patient.

Dr. Thayer has followed Dr. Shattuck's scheme and is sure the patients do better. Body weight is saved. There is never any harm done. There is no reason for believing hæmorrhage in increased, nor does it favor perforation. The residue is not increased, and it would make no difference if it were.

Dr. Thayer said he felt very strongly upon the subject. From the standpoint of common sense it is the only course to pursue. He believes one should use common sense and not a rule. The public are frightened about feeding. But one should pay no attention to them and carry out what he thinks is best.

Dr. W. G. MacCallum.—A wave of indignation passes over me when I think of being starved and exposed to the dangers incident to starvation!

Milk becomes solid and less digestible than other foods. Everything becomes liquefied in the intestines. Cohnheim has shown that large lumps stay in the stomach until liquid, but minced meat passes through while still solid. All food must undergo the same change before reaching the ulcers. Weber has shown that the increased protein downfall in fever can be eliminated by an increased carbohydrate intake and nitrogenous equilibrium maintained. Everything points to the advantage gained by a liberal diet.

III. Exhibition of Pathological Specimens. Dr. W. G. MacCallum.

Dr. MacCallum spoke of the changes from syphilis in the trachea and bronchi. They are usually tertiary and quite serious. They develop in the mucous membrane or outside in the glands, breaking down into ulcers and loss of tissue. The destruction is more extensive than usually seen in tuberculosis. They occur in the lower trachea, near the bifurcation. Ulceration extends to the cartilages, eroding them, and is followed by scarring, distortion, and stenosis.

The rigidity of the trachea is gone and so a kinking occurs. The symptoms are those of interference with respiration.

The first specimen shown was just such a deep ulceration in the trachea with extensive granulation tissue and involvement of the glands. A syphilitic mesaortitis was associated. The woman had choked to death.

In the second specimen a syphilitic stricture was present at the bifurcation of the trachea, shutting off respiration from both lungs. A general bronchopneumonia was associated with dilatation of the bronchi. Dr. MacCallum emphasized this as one of the chief causes of bronchiectasis.

They usually result in death from prolonged attacks of dyspnœa. Operation, mercury, and the iodides give good results.

The other specimens were from three cases of occlusion of the cœliac axis with development of a collateral circulation. In the first case the superior mesenteric artery was plugged by a thrombus which developed upon a patch of arteriosclerosis. The pancreatico-duodenal and gastro-duodenal arteries were dilated, giving a good circulation. There was no sign of infarction. The second case showed the same collateral circulation by the cœliac axis. In it an embolus from the mitral valve (mitral stenosis) plugged the superior mesenteric artery.

In the third case, one of advanced arteriosclerosis, the orifice of the cœliac axis was filled with a clot in an aneurysmal sac. The cœliac axis ran alongside but was obliterated by this pressure. The collateral circulation was from the superior mesenteric artery by the pancreatico-duodenal to the branches of the cœliac axis. Again there was no sign of infarction or impaired blood supply.

May 3, 1909.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Frank R. Smith, the president, in the chair.

I. Exhibition of Surgical Cases. DR. HARVEY CUSHING.

The first case shown by Dr. Cushing was operated upon nine months ago and a tumor in the cerebellum removed satisfactorily. The patient has done well, gained 50 lbs. in weight, and is back at work. The gain in weight is probably coincident with the liberation of the secretion of the pituitary body, which the increased intracranial tension had thrown out of function. The patient walks well now. There is no headache, no choked discs, nystagmus, or ataxia. Dr. Mallory reports the tumor an encapsulated glioma, although the latter are usually looked upon as infiltrating.

The second case was operated upon 3 weeks ago. He had had a high grade of choked discs with only a little loss of vision. He is one of 4 suboccipital operations in the hospital at the present time. No growth was found but there is considerable improvement from the suboccipital decompression. He has perfect use of his neck although the cervical muscles were divided and part of the foramen magnum excised.

The third case was a carpenter, 26 years old. He complained of headaches and unsteadiness. The examination was negative. He had grown progressively worse and 8 weeks ago, in another hospital, the lateral ventricle was aspirated for a cyst. Here 3 weeks ago, the symptoms pointed to a right extracerebellar tumor. It proved to be a left intracerebellar benign cyst. The removal was successful and the patient is making a complete recovery. His vision, lost before operation, is returning.

In summary, Dr. Cushing said there were 4 such cases in the hospital now with suboccipital operations. In the other two no lesions had been found. As to statistics, of 30 known or presumed cerebellar tumor cases undergoing suboccipital exploration 3 had died. One of these died from pneumonia. There were no other complications. The tumor was found and removed in 11 cases. 3 were solid tumors, 4 cysts which were evacuated, and 4 were extracerebellar tumors. No improvement followed the removal in 2 instances. In 12 cases, no tumor was found and simple decompression was performed. In 2 of these subsequently a cyst and a solid tumor were found.

Inasmuch as these are usually regarded as most unfavorable tumors, the results are remarkably good. Dr. Cushing now considers them favorable cases.

Interesting points are:

1. The number of mistaken diagnoses. The lesion is treated often for years under the diagnosis of labyrinthine disease, gastric headaches, and hysteria.

2. The blindness. Of 11 successful extirpations, 6 were totally blind before operation.

Discussion.

DR. T. B. FUTCHER.—I saw the first case in July, 1908, in consultation. He complained of nausea, vomiting, and some dizziness. There were no ocular features. He was treated for gastric disturbances without improvement. Later the failure of vision occurred and the choked discs were discovered. The importance of the cerebral origin of gastric disturbances is rightly emphasized!

II. Brain Tumors: A Preliminary Discussion with Lantern Slides. DR. CHARLES LAMBERT, New York City, N. Y.

Dr. Lambert read an elaborate paper upon the subject of brain tumors based on his study of 40 brain tumors from the New York hospitals during the last six years. His remarks were freely illustrated by lantern slides of gross and microscopical specimens.

Dr. Lambert noted that cortical tumors occurred most frequently, and tumors in the basal ganglia least so. More are in the left hemisphere than the right.

He adopted, from his analysis, a unit of growth for brain tumors consisting of a central vessel with fibroblastic arrangement about it. Then comes a neurogliar layer, and more distant the more ependymal type. The pattern is followed by the different tumors—vascular centers with fibroblastic, neurogliar, and ependymal arrangement about them. The cells orient themselves according to the nutrition with degeneration in the intermediary portion. This is the general plan of growth of the gliomata. Gliomata are essentially within the brain as compared to endotheliomata. They vary from rapid-growing embryonic tissue to mature fibroblastic type.

A series of dural tumors, endotheliomata, were shown upon the screen. Microscopically the beginnings of the tumors are seen in the endothelium lining the dura mater. The proliferation of endothelium is associated with the pursuit of vessels into the tumor. The characteristics of these tumors are the whirls or nests of proliferating cells lining the lymph and blood vessels. Pial tumors are essentially vascular, made up of vessels with thickened walls. In addition congenital cavernous angiomata were described.

Illustrations were shown of an area in the pons resembling a hæmorrhagic infarct, due to the squeezing of the pons into the foramen magnum during the sudden release of pressure by lumbar puncture. This was followed by sudden exitus.

In summary: I. Endotheliomata may be (1) dural, (2) dural and pial, mixed, (3) pial, hæmangiomata, and (4) congenital cavernous angiomata.

II. Gliomata exhibit the types of cells known as (1) ependymal, (2) neurogliar, the diffuse astrocytic cell, and (3) the marginal fibrillæ, the one or the other predominating to the submission of the rest.

Gliomata are getting back to the embryonic cell; endotheliomata are more adult.

III. Obstructions of the Inferior Vena Cava. DR. J. HALL PLEASANTS.

Dr. Pleasants presented a complete analysis of the cases of obstruction to the inferior vena cava in the literature and the Johns Hopkins Hospital to date. Of 400,000 admissions to the Johns Hopkins Hospital and Dispensary there are but 16 cases recorded. 14 of these have been among the 3000 autopsies performed. Welch in 1893 reported 193 cases in the literature, and the total now is 303.

Dr. Pleasants noted that the only valve was near the heart. Slight enlargements at the renal and hepatic veins allow a division of the inferior vena cava into the lower, middle and upper thirds. The vein is more likely to be occluded by pressure as it passes behind the liver.

The occurrence is more frequent than generally supposed. As to age, a few cases are in children but the majority are after 40, in the third and fourth decades.

200 cases were due to thrombosis, and all the conditions predisposing to thrombosis are represented. Primary thrombosis is reported but the cause not determined. Thrombosis usually begins in branches and extends to the main vessel. It is commonly from the iliac veins in infectious diseases. The inferior vena cava may be the path of extension from one branch to another, as iliac to iliac. New growth was the starting-point in 21 cases, presumably by slowing the stream and increasing the chance of infection. Embolism occurred in only 2 cases.

Three cases were due to amœbic abscess of the liver, in the Hopkins series, these being the only instances found. Perforation of the inferior vena cava occurred in 2 of these.

The symptoms are often hard to differentiate from the underlying condition giving rise to the obstruction. The 2 most important are mechanical effects, namely: (1) œdema, and (2) collateral circulation.

The œdema of the feet, legs, and lower half of the body is marked. The unilateral œdema described by Schlesinger is interesting. The œdemas may be transitory. They disappear with the development of a collateral circulation. Rapid obstruction is fatal on account of the lack of collateral circulation. Dilated veins upon the legs are due to associated iliac obstruction.

The following tables show a classification of all the cases:

I. *Thrombosis*—198 cases.

A. Arising within the inferior vena cava or its branches—50 cases:

	Cases.	
1. Infectious diseases		40
Typhoid fever	15	
Scarlet fever	2	
Pneumonia	2	
Smallpox	1	
Meningitis	1	
Erysipelas	1	
Tonsillitis	1	
Cholera	1	
Tuberculosis	16	
2. Chlorosis		8
3. "Over-exertion"		2

B. Extension from localized foci of disease—108 cases:

	Cases.
1. Puerperal sepsis	36
2. Local inflammatory foci	18
3. Cirrhosis of the liver	8
4. Abscess of the liver	8
5. Trauma	17
6. New growths	21

C. Of unknown origin—40 cases:

II. *New growths from the wall of the inferior vena cava*—2 cases.

III. *Invasion of the lumen by a new growth ("new-growth thrombosis")*—46 cases:

	Cases.
1. Cancer of the kidney	13
2. Sarcoma of the kidney	6
3. Sarcoma of the "pelvis"	2
4. Cancer of the "peritoneum"	3
5. Cancer of the liver	3
6. Cancer of the parotid gland	1
7. Cancer of the testicle	5
8. Sarcoma of the testicle	2
9. Sarcoma of the vertebræ	2
10. Cancer of the uterus	1
11. Sarcoma of the ovary	1
12. Sarcoma of the "peritoneum"	1
13. New growth of undetermined origin	6

IV. *Pressure*—43 cases:

	Cases.	
1. New growths		17
2. Diseases of the liver:		
Cirrhosis	3	
Syphilis	7	
Echinococcus cyst	6	
3. Enlarged pancreas		1
4. Enlarged retroperitoneal glands		4
5. Fibrous adhesions		3
6. Aneurysms		2

V. *Kinking of the inferior vena cava*—2 cases.

VI. *Congenital*—9 cases.

VII. *Involving both the inferior and the superior vena cava*—4 cases.

The series at the Johns Hopkins Hospital includes cases of obstruction, as follows:

	Cases.
Due to embolism in typhoid fever	1
Due to thrombosis in tuberculous peritonitis	1
In puerperal sepsis	3
In amœbic abscess of the liver	3
In chronic appendicitis	1
In perirectal abscess	1
In syphilis of the liver	1
Due to congenital thrombosis(?)	1
Due to invasion by an endothelioma of the right kidney	1
By sarcoma of the lumbar vertebræ	1
By angiosarcoma of the left ovary	1
And of unknown cause	2

May 17, 1909.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Frank R. Smith, the president, in the chair.

I. Pellagra. DR. W. S. THAYER.

This paper appeared in the JOHNS HOPKINS HOSPITAL BULLETIN, July, 1909.

II. Etiology of Movable Kidney. DR. F. WEBB GRIFFITH.

This paper will be published in the BULLETIN.

III. Treatment with Tuberculin in the Dispensary. DR. LOUIS HAMMAN.

This paper appeared in the JOHNS HOPKINS HOSPITAL BULLETIN, August, 1909.

IV. Subcutaneous Purgatives—A Clinical Study on Phenoltetrachlorphthalein. DR. L. G. ROWNTREE. (From the Pharmacological Laboratory and the Medical Clinic of the Johns Hopkins University.)

The need of a subcutaneous purgative is pointed out. An ideal subcutaneous purgative must possess the following properties: It must act on the intestinal tract and on the intestinal tract only without any untoward effect on any other organ or system, must act with certainty, must be readily soluble (preferably in water) in order that the amount of fluid to be injected may be small, and it must be non-irritant locally. As a rule, it should produce its effect within a short time, although in some conditions an action delayed in onset but prolonged in character is to be preferred.

The literature dealing with the question of subcutaneous purgatives is reviewed. The different substances heretofore utilized for this purpose are contrasted with the ideal purgative described above, and their value in this field is discussed.

It is shown that although intestinal peristalsis is undoubtedly increased by some, at least, of the salines, yet the increase in activity is not sufficiently marked to result in purgation unless toxic or lethal doses are injected. The salines, therefore, are of no practical importance to medicine as subcutaneous purgatives.

Its toxicity and the wide-spread nature of its activity preclude the general adoption of barium chloride in this field.

The vegetable purgatives, such as aloes, colocynth, cathartinic acid, oleum ricini, and oleum tiglii, although possessing the power of inducing purgation, are debarred from this field on account of the marked irritation they produce at the point of injection.

Among alkaloids, apocodeine hydrochlorate in doses of .02 gm. to .05 gm. is a serviceable hypodermic purgative in many instances, but is unsatisfactory inasmuch as it is uncertain and involves systems and organs other than the alimentary and is somewhat too irritant locally.

Eserine undoubtedly has its place in practical therapeutics in warding off intestinal paresis following abdominal operations, in expelling gas from a distended intestine and in overcoming intestinal atony following parturition, but it is an exceedingly powerful alkaloid and must be used judiciously. It can never come into general use as a subcutaneous purgative.

More information must be furnished as to the mode of preparation and as to the chemical properties of podophthalyl before it can be further investigated. No clinical reports have as yet been published.

Phenoltetrachlorphthalein is next considered and the method of making its oil preparation described. A brief outline of the manner of its absorption and excretion and its mode of action is given.

A table is presented showing the results obtained by its subcutaneous administration in 0.2- and 0.3-gm. doses (10 and 15 cc. of the oil preparation) to five patients in the obstetrical ward. These results, though not entirely satisfactory, indicate that this drug possesses decided laxative value and that its laxative action is of a prolonged character.

Another table is presented showing its effect when 0.4 gm. (20 cc. of the oil preparation) is given hypodermically to patients suffering from chronic constipation. Ten out of twenty-five patients after receiving one injection of this oil preparation together with instructions as to diet, hygiene, and habit have had no return of constipation, although at least two months and in some instances as many as six months have elapsed since its administration.

The draw-backs in the way of the general adoption of phenoltetrachlorphthalein as a subcutaneous purgative are:

1. The insolubility of this drug in water.
2. The slight degree of its solubility in oil, necessitating a large volume for injection.
3. The long time that elapses before the onset of purgation (18 to 24 hours).
4. The mild character of its action, which is laxative rather than purgative.

Its redeeming features:

1. The prolonged nature of its action.
2. The absence of crampy pain and colic throughout the period of its action.
3. Its non-irritant effect locally.
4. The constancy, at least in the cases so far studied, with which it has produced its result.
5. The non-toxicity of the drug.

Phenoltetrachlorphthalein is efficient, non-toxic and non-

irritant when administered as a subcutaneous purgative, but its insolubility in water and its low solubility in oil stand in the way of its wide application, as such, in practical therapeutics, but do not detract from its efficiency when a subcutaneous purgative is indicated. It may prove of value:

1. In coma.
2. In marked gastrointestinal irritability when nothing can be given by mouth.
3. Among the insane, who often refuse to swallow medicine and who fight against enemata.
4. In chronic constipation, together with hygienic, dietetic and psychical treatment.

It is worthy of a trial in the field of abdominal surgery, where its introduction beneath the skin can be accomplished during the anæsthesia without any pain whatever and where its mild, prolonged, laxative effect, continuing for from four to six days, may possibly entirely dispense with the necessity of administering any purgative by mouth during the first week subsequent to the operation.

THE LÆNNEC.

March 22, 1908.

Meeting of the Lænnec Society for the Study of Tuberculosis, Dr. H. B. Jacobs, the president, in the chair.

I. Tuberculosis of the Liver. Dr. W. S. Thayer.

This patient, a colored woman, aged 49, was operated upon for a tubo-ovarian abscess in 1892. Last fall she was admitted with fever and tenderness in the right upper abdomen. There was an indefinite resistance in the liver region at first and gradually it became palpable. The irregularly remittent fever and absence of leucocytosis suggested tuberculosis, and, with the suggestion of adherent intestines, a diagnosis of tuberculous peritonitis was made.

She had just recently returned with diarrhœa, fever, sweats, and a rapid loss of strength. Both apices and different parts of the lungs were involved. The liver was large, firm, and smooth. Last night she died, and the autopsy to-day showed fresh pulmonary tuberculosis. There was a marked caries of the sixth dorsal spine. The tuberculous peritonitis was adhesive, walling off cavities containing chyliform fluid (the third such case this year). The liver shows a most interesting picture. Through the surface white nodules are visible, and on section the tissue is studded with white, raised areas—a translucent ring around a caseous center. It is a nodular tuberculosis of the liver.

The case is striking, first, on account of the rarity of so extensively caseating a tuberculosis of the liver in a woman of 49, and second, because the prominent symptom clinically was the enlarged liver.

Discussion.

Dr. W. H. Welch.—It would be interesting to get out the type of tubercle bacillus. It may be bovine, but the chances are against it. Weigert, years ago, pointed out this peculiar cirrhosis of the liver in the presence of tubercles with more or less ascites. They are on the order of solitary tubercles, only more numerous. It is difficult to localize the primary focus in this case.

Dr. M. C. Winternitz.—There were numerous desquamated epithelial cells in the fluid, but no tubercle bacilli.

II. A Study of Recent Educational Leaflets. Dr. Chas. J. Hatfield, Philadelphia.

The speaker summed up the qualities of a desirable leaflet for lay perusal bearing upon pulmonary tuberculosis. He pointed out the hopefulness of popular education as a means of prevention of the disease. Exhibitions with demonstrations of the cause, prevention, and means of treatment of tuberculosis were first instituted at the Johns Hopkins Hospital. And it is encouraging that the people are anxious to be taught what can be done in prophylaxis. The enormous attendance at exhibitions in New York and Philadelphia recently are evidence of this.

To be useful a leaflet must be comprehensive. It must outline the predisposing causes. It must emphasize alcohol as the agent of lowered resistance in the chronic habitual drinker. The exciting cause, a short description of the bacillus, the methods of infection as inhalation of dust, food, drink, break in the skin, must all be included. The early symptoms should be made plain, and stress must be laid upon all the essentials of cure. The value of fresh air and the lack of danger in the night air and draughts; the value of foods, with a list of cheap nutritious foods; rest, the avoidance of overwork or fatigue—these are all important.

No consumptive was ever harmed by two much rest; many are by over exercise. The layman should be warned against the quack who traffics in human lives.

But the most important part of such a leaflet is that dealing with prevention:

1. The care of the sputum.
2. The care of the house.
3. The care of the patient's body.
4. The care of intermediate objects.

It is important to state that the careful patient is not a danger to those about him. Co-operation with the State laws should be emphasized. Finally there should be added a list of dispensaries, sanatoria, with the hours for treatment.

So much for the ideal educational leaflet!

Discussion.

Dr. H. B. Jacobs.—I want to emphasize the value of such papers to students. They are not to be heard elsewhere. These are things which it is important to have come within the knowledge of students.

III. Marmorek's Serum in the Treatment of Pulmonary Tuberculosis. Dr. Wolman.

See Article No. 3 in the Johns Hopkins Hospital Bulletin, August, 1909.

Discussion.

Dr. C. V. Pirquet.—In Vienna we obtained the same results as most clinics, and found no effect, good or bad, with this serum. The theory is a good one, but it does not work. This is not a problem which will be solved by finding a serum at all. Grüner injected a combination of tuberculin and

Marmorek's serum subcutaneously. It had no more effect than so much water. The fact that rectal injection is possible shows the serum has no effect. If antidiphtheric serum is given per os or rectum, no antitoxin is absorbed.

DR. W. H. WELCH.—Prof. A. E. Wright holds that an accidental amount of tuberculin is the only value in Marmorek's serum. McClintock has pointed out that digestion can be inhibited with sodium bicarbonate and opium so that absorption of antitoxin can occur.

IV. The Employment of Arrested Tuberculous Cases. DR. FORSTER.

See Article No. 4 in the JOHNS HOPKINS HOSPITAL BULLETIN, August, 1909.

DISCUSSION.

DR. HATFIELD.—It is important that the colony should be self-supporting, if possible. The large proportion of patients are able to stand work. At White Haven the work is graduated—one hour at first, increasing one half hour every week. As the work was increased, it was found the strength had, up to six hours a day. But all the heavier work must be done by healthy individuals.

The Phipps Institute, at Philadelphia, employs the arrested cases as nurses for advanced cases. Twenty-two such individuals have been graduated from a two-year course and are now occupying profitable positions nursing tuberculous cases.

DR. HUNNER.—Do you encounter any prejudice in disposing of the fruits of the colony?

DR. FORSTER, in reply: The surplus products are sold in wholesale markets in the mornings without question. A higher price is obtained because of the care in selection and packing. They are also sold in the town of Towson without question. At Eudowood graduated patients are also employed as trained nurses with success.

The announcement of the Lænnec Prize was then made. (See the JOHNS HOPKINS HOSPITAL BULLETIN, May, 1909.)

The election of officers for the ensuing year resulted in the re-election of Dr. Henry Barton Jacobs as president, and Dr. Louis Hamman as secretary.

BOOKS RECEIVED.

Experimental Pharmacology. A Laboratory Guide for the Study of the Physiological Action of Drugs. By Charles Wilson Greene, Ph. D. Third edition, revised. With 37 new illustrations. 1909. 8vo. 76 pages. P. Blakiston's Son & Co., Philadelphia.

Hydrotherapy. A Brief Summary of the Practical Value of Water in Disease. By William H. Dieffenbach, M. D. 1909. 8vo. 267 pages. Rebman Company, New York.

City of New York. Department of Public Charities. City Hospital, Blackwell's Island. Medical and Surgical Report. Number 1, 1909. 4to. 237 pages. Martin B. Brown Company, New York.

Legal Medicine and Toxicology. By R. L. Emerson, A. B., M. D. (Harvard). 1909. 8vo. 593 pages. D. Appleton & Company, New York and London.

Studies of Criminal Responsibility and Limited Responsibility. By Charles Follen Folsom, A. M., M. D. 1909. 8vo. 153 pages. Privately printed.

The Principles and Practice of Medicine. By William Osler, M. D. Seventh edition, thoroughly revised. 1909. 8vo. 1143 pages. D. Appleton & Company, New York and London.

Modern Medicine. Its Theory and Practice. In original Contributions by American and Foreign Authors. Edited by William Osler, M. D. Assisted by Thomas McCrae, M. D. Volume VI. Diseases of the Urinary System—Diseases of the Ductless Glands—Diseases of Obscure Causation—Diseases of the Muscles—Vasomotor and Trophic Disorders—Life Insurance. Illustrated. 1909. 8vo. 799 pages. Lea & Febiger, Philadelphia and New York.

Archives of Neurology and Psychiatry. From the Pathological Laboratory of the London County Asylums, Claybury, Essex. Edited by Frederick Walker Mott, M. D., F. R. S., F. R. C. P. Vol. IV. 1909. 8vo. 330 pages. P. S. King & Son, Westminster.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Nineteenth series. Volume II. 1909. 8vo. 301 pages. J. B. Lippincott Company, Philadelphia and London.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D.; assisted by H. R. M. Landis, M. D. Volume II. June, 1909. 8vo. 317 pages. Lea & Febiger, Philadelphia and New York.

A Text-book of the Diseases of the Ear. By Professor Dr. Adam Politzer. Translated at the personal request of the author and edited by Milton J. Ballin, Ph. B., M. D., and Clarence L. Heller, M. D. Fifth edition, revised and enlarged. With 337 original illustrations. 1909. 8vo. 892 pages. Lea & Febiger, Philadelphia and New York.

L'Hypophyse et la Médication Hypophysaire. (Étude Expérimentale et Clinique.) Par M. le Docteur Arthur Delille. 1909. 4to. 336 pages. G. Steinheil, Paris.

Children in Health and Disease. A Study of Child-Life. By David Forsyth, M. D., D. Sc. With frontispiece. 1909. 8vo. 362 pages. P. Blakiston's Son & Co., Philadelphia.

A Manual of Operative Surgery. By Sir Frederick Treves, Bart. G. C. V. O., C. B., LL. B., F. R. C. S., and Jonathan Hutchinson, F. R. C. S. Third edition, with new colored plates and many new illustrations in the text. Volume I. 1909. 8vo. 775 pages. Lea & Febiger, Philadelphia and New York.

Saint Thomas's Hospital Reports. Edited by Dr. H. G. Turney and Mr. W. H. Battle. New series. Volume XXXVI. 1907. 8vo. 390 pages. 1909. J. & A. Churchill, London.

Tuberculosis. A Preventable and Curable Disease. Modern Methods for the Solution of the Tuberculosis Problem. By S. Adolphus Knopf, M. D. 1909. 12mo. 394 pages. Moffat, Yard & Company, New York.

Myomata of the Uterus. By Howard A. Kelly and Thomas S. Cullen. Illustrated by August Horn and Hermann Becker. 1909. 4to. 723 pages. W. B. Saunders Company, Philadelphia and London.

Dietetics for Nurses. By Julius Friedenwald, M. D., and John Ruhräh, M. D. Second edition, revised and enlarged. 1909. 12mo. 395 pages. W. B. Saunders Company, Philadelphia and London.

Oxford Medical Publications. Publishers: Henry Frowde, London; Hodder & Stoughton, London. The following 8 volumes:

Studies on Immunity. By Robert Muir, M. A., M. D., in collaboration with Carl H. Browning, M. D., Alexander R. Ferguson, M. D., and William B. M. Martin, M. B., Ch. B. 1909. 8vo. 216 pages.

Common Disorders and Diseases of Childhood. By George Frederic Still, M. A., M. D. (Cantab.), F. R. C. P. (Lond.). 1909. 8vo. 731 pages.

Medical Inspection of Schools. By A. H. Hogarth, M. B., B. Ch., Oxon., D. P. H. 1909. 12mo. 360 pages.

Graphic Methods in Heart Disease. By John Hay, M. D., M. R. C. P. With an introduction by James Mackenzie, M. D., M. R. C. P. 1909. 12mo. 184 pages.

Inborn Errors of Metabolism. The Croonian Lectures delivered before the Royal College of Physicians of London, in June, 1908. By Archibald E. Garrod, D. M., M. A. Oxon. 1909. 12mo. 168 pages.

Suture of Arteries. An Experimental Research. By E. Archibald Smith, M. B., Ch. B. Victoria University, F. R. C. S., England. 1909. 8vo. 70 pages.

The Blood in Health and Disease. By R. J. M. Buchanan, M. D., F. R. C. P. 1909. 8vo. 318 pages.

Aseptic Surgery. By Charles Barrett Lockwood, F. R. C. S. Third edition. 1909. 12mo. 275 pages.

Bulletin of Iowa Institutions. (Under the Board of Control.) Published quarterly. Volume X. 1908. 8vo. 344 pages. Des Moines, Iowa.

Treatment of the Diseases of Children. By Charles Gilmore Kerley. Second edition, revised. 1909. 8vo. 629 pages. W. B. Saunders Company, Philadelphia and London.

Nothnagel's Practice. Diseases of the Intestines and Peritoneum. By Prof. Dr. Hermann Nothnagel. Edited, with additions, by H. D. Rolleston, M. A., M. D., F. R. C. P. Second edition, thoroughly revised. Authorized translation from the German, under the editorial supervision of Alfred Stengel, M. D. 1907. 8vo. 1059 pages. W. B. Saunders Company, Philadelphia and London.

Pye's Surgical Handicraft. A Manual of Surgical Manipulations, Minor Surgery and Other Matters Connected with the Work of House Surgeons and Surgical Dressers. Fifth edition, revised and largely rewritten by W. H. Clayton-Greene, B. A., M. B., B. C. (Cantab.), F. R. C. S. (Eng.). With 343 illustrations and plates newly drawn for this edition. 1909. 8vo. 592 pages. John Wright & Sons, Ltd., Bristol; Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London.

Mental Medicine. Some Practical Suggestions from a Spiritual Standpoint. Five Conferences with Students at the Johns Hopkins Medical School. By Oliver Huckel, S. T. D. With an Introduction by Lewellys F. Barker, M. D. 1909. 12mo. 214 pages. Thomas Y. Crowell & Company, New York.

The Ophthalmic Year Book. Volume VI. Containing a Digest of the Literature of Ophthalmology with Index of Publications for the Year 1908. By Edward Jackson, A. M., M. D., George E. de Schweinitz, A. M., M. D., Theodore B. Schneideman, A. M., M. D. Illustrated. 1909. 8vo. 415 pages. The Herrick Book and Stationery Company, Denver, Colo.

Principles of Pharmacy. By Henry V. Arny, Ph. G., Ph. D. With 246 original illustrations. 1909. 8vo. 1175 pages. W. B. Saunders Company, Philadelphia and London.

Bier's Hyperemic Treatment. In Surgery, Medicine and the Specialties. A Manual of its Practical Application. By Willy Meyer, M. D., and Prof. Dr. Victor Schmieden. Second revised edition, enlarged. Illustrated. 1909. 8vo. 280 pages. W. B. Saunders Company, Philadelphia and London.

Arthritis Deformans: Comprising Rheumatoid Arthritis, Osteo-Arthritis and Spondylitis Deformans. By R. Llewellyn Jones, M. B., Lond. With thirty-eight full page plates. 1909. 8vo. 365 pages. John Wright & Sons, Ltd., Bristol; Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London.

Surgical Diagnosis. By Alexander Bryan Johnson, Ph. B., M. D. Volume I. With one colored plate and two hundred and fifty-seven illustrations in text. 810 pages. Volume II. With three colored plates and two hundred and fifty-three illustrations in text. 777 pages. 8vo. 1909. D. Appleton & Company.

Atlas of the External Diseases of the Eye. Including a Brief Treatise on the Pathology and Treatment. By Prof. Dr. O. Haab. Authorized translation from the German. Third edition, revised. Edited by G. E. de Schweinitz, A. M., M. D. With 101 colored lithographic illustrations on 46 plates. 1909. 12mo. 244 pages. W. B. Saunders Company, Philadelphia and London.

NOTES ON NEW BOOKS.

International Clinics. Vol. I. 19th Series. (*Philadelphia and London: J. B. Lippincott Company, 1909.*)

There are a number of exceptionally interesting papers in this volume; one by Howard, of Montreal, who has collected all the cases of Mikulicz's disease, and carefully studied and analyzed them, and given the first satisfactory description of this disease in its relation to allied conditions; others by Duval and Vinard on "Sporotrichosis," by F. A. Richardson on "Excision of the Hip-joint in Arthritis Deformans," and MacCallum on "Absorption from the Peritoneal Cavity." The volume, in addition to its usual sections on Treatment, Medicine, Surgery, etc., with its contributions by European as well as American practitioners, has three chapters on the "Progress of Medicine during 1908." "Treatment" is handled by Stevens, "Medicine" by Edsall and "Surgery" by Bloodgood. The first volume of the new series makes an excellent beginning.

Studies in Puncture Fluids. A Contribution to Clinical Pathology. By O. C. Gruner, M. B., London, Clinical Pathologist at the General Infirmary, Leeds. 289 pages. (*Philadelphia: P. Blakiston's Son & Co., 1908.*)

It is partly on account of the author's investigations, but mainly because of the excellent collection of data from the literature on "puncture fluids," that the present volume will prove serviceable. The fluids have been studied very fully, as the following headings from the sections of the work will indicate: (1) The Chemical Examination of Puncture Fluids; (2) The Physico-Chemical Examination of Puncture Fluids; (3) The Characters Possessed by Various Puncture Fluids; (4) The Differential Diagnosis of Exudates from Transudates; (5) Cytodiagnosis. The final section details analyses of various pleural and peritoneal fluids. As a work of reference, the present volume should prove of great value in the more exact examination of exudates and transudates.

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ON SOME OF THE CLINICAL METHODS OF INVESTIGATING CARDIO-VASCULAR CONDITIONS.

THE JEROME COCHRAN LECTURE, ALABAMA STATE MEDICAL ASSOCIATION, 1909.

By Lewellys F. Barker, M. D.,

Professor of Medicine in the Johns Hopkins University; Physician-in-Chief to the Johns Hopkins Hospital.

Though it is my purpose to mention especially some of the newer methods of examining the heart and vessels, I wish to emphasize in the beginning that these newer methods are to be regarded only as supplements to the time-honored methods of inspection, palpation, percussion and auscultation. Any clinician of experience will tell you that if he had to choose between giving up the newer methods and these older methods of examination there would be no hesitation in his choice.

By inspection we recognize the presence of bulgings in the region of the heart, the pulsations due to the apex, to the right ventricle and to aneurisms, as well as abnormal throbbing of the vessels of the neck or of the abdomen, dilatation of the veins and gross variations in the character of the venous pulse. Retractions of the chest wall, owing to pericardial adhesions (Broadbent's sign), are also recognizable on inspection.

By palpation we learn of the presence of thrills and of shocks over the heart or over an aneurismal sac, and palpation of the pulse yields to the skilled observer information regarding its rate, rhythm, volume, celerity and tension which may approach in precision the results obtainable by instrumental methods.

By percussion we are able to outline now very accurately the portion of the heart not covered by the lungs and also the circumference of the heart as projected in a surface-figure on the anterior wall of the chest, as well as to recognize marked enlargements of the great vessels.

On auscultation we observe any deviation from the normal strength and character of the two sounds of the heart. We can locate cardiac murmurs and determine their areas of maximal and minimal intensity. Reduplications, splittings and accentuations of the sounds and alterations in rhythm are among the phenomena which can be studied by stethoscopy. Auscultation is a practical means especially for obtaining clues as to the condition of the different valves of the heart (stenosis, insufficiency), but it also yields important data concerning the length of systole and diastole, the condition of the myocardium, of the pericardium, of the arterial pressure and of the regulatory mechanisms of the heart.

I shall take the time to refer to a few only of the interesting

features of the older methods of examination before passing on to a discussion of the instruments of precision more recently introduced for the study of the circulatory organs.

Of these it is perhaps to the methods of percussion of the heart that during the last few years most attention has been paid. We have learned the very great importance of varying the force of the percussion stroke, feeble percussion for certain delimitations being very much more helpful than forcible percussion. In determining the absolute or superficial cardiac dulness especially we depend entirely upon feeble percussion. The method, when applied to the demarcation of the margin of the right lung, sometimes permits the demonstration of the presence of the step-like line of Kroenig,[1] which is regarded as pathognomonic for enlargement of the right side of the heart (Fig. 1). Feeble percussion also permits us to recognize to the left of the sternum below the second intercostal space an area of absolute dulness, chimney-like in shape, in mitral disease (due to the enlargement of the left atrium) and in patent ductus Botalli (due to the dilated pulmonary artery).

Far more valuable, however, than the determination of the area of superficial ("small" or "absolute") cardiac dulness is the outlining of the deep ("large" or "relative") heart

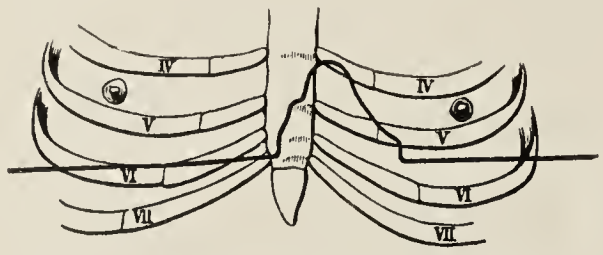


Fig. 1.—Step-like line of Kroenig.

dulness. Accurate delimitation here I regard as one of the more difficult of clinical technical proceedings, though many are self-deceived into thinking it very easy and very much simpler of performance. Ask six men to make the delimitation on a given case independently and compare the results subsequently with one another and with an outline obtained in an orthodiagraph and you will quickly convince yourselves of the uncertainties of the methods as ordinarily applied. The fact, too, that so many special methods have been recommended for the purpose is proof of the difficulty of exact determination of the area of relative dulness; I need only recall (1) the methods of forcible and medium-forcible percussion in general use, (2) the method of threshold-percussion,[2] (3) that of palpatory percussion,[3] (4) that of percussion with lateral damping (A. Schott), and (5) that of Moritz.[4]

On auscultation it cannot be too prominently kept in mind that what we call the first sound and the second sound of the heart are each complex conglomerates of sounds of different origin. The first sound is due chiefly to the closure of the mitral and tricuspid valves and to the contraction of the muscular walls of the right and left ventricle, while the second sound is due to the closure of the aortic semilunar valves and the valves at the root of the pulmonary artery. We can, it is true, get an idea of the contribution of each of these factors to the compound sound by remembering the position of the individual valves as regards the chest wall and applying the bell of the stethoscope accordingly; but even at these sites of auscultatory election we rarely if ever hear a sound which is unitary in its origin; on the contrary, minor contributions from more distant sources combine with the maximal contribution of the source most adjacent, and the analyst has to make up his mind after careful listening at all the auscultation-sites as to the condition of the various sound-emitting mechanisms.

On auscultation, the practitioner may have the detection of murmurs so much in his mind that he fails to note differences in intensity of the various sounds, an unfortunate omission, since feeble heart sounds give important clues to weakening of the walls of the various heart chambers and accentuated heart sounds betray over-activity of certain parts of the heart or increased pressure in the larger or in the lesser arterial system. We are learning also to pay more attention than formerly to certain splittings and doublings of the heart-sounds. Particularly to the extra heart sounds occurring between the end of the second sound and the beginning of the first sound have clinicians of late directed their researches. Sound-interpolations of this sort give a peculiar rhythm to the cardiac sounds which on account of their resemblance to the sound made by a galloping horse are known as "gallop-rhythm." When the third sound occurs just before the first sound of the heart the rhythm which results is known as a *presystolic gallop,* while a third sound occurring soon after the second sound of the heart, that is, early in diastole, yields a rhythm known as the *protodiastolic gallop.* These three-time rhythms differ from the three-time rhythm of mitral stenosis not only in the character of the extra sound heard but also in topographical distribution. The presystolic type of gallop-rhythm seems to be due to an abnormally strong contraction of the atrial musculature and an abnormally long interval between the atrial and ventricular contractions; the origin of the protodiastolic gallop-rhythm, on the other hand, is more difficult to explain; some have thought that it depends upon a sudden strain thrown upon the relaxed and weakened muscular wall of the left ventricle by a sudden inrush of blood from the atrium at the beginning of diastole at the time the mitral valve opens. The frequency of gallop-rhythm in arteriosclerosis and especially in contracted kidney is familiar to all who have studied the heart carefully in these affections.[5]

Recent studies, especially those of my colleague Dr. Thayer,

[1] Kroenig, Berl. klin. Wchnschr. 1899, 274.

[2] Ewald (C. A.), Ueber einige praktische Kunstgriffe bei Bestimmung der relativen Herz- und Leberdämpfung; Charité Annalen, ii Jahrg., 1875, Berlin, 1877, 191; Goldscheider (A.), Zur Schwellenwerthsperkussion des Herzens, Deutsche med. Wchnschr., 1907, XXXIII, 1121-1124.

[3] Ebstein, Die Tastpercussion. Ein Leitfaden. Stuttgart, 1901.

[4] Moritz (F.), Einige Bemerkungen zur Frage der perkutorischen Darstellung der gesammten Vorderfläche des Herzens, Deutsches Arch. f. klin. Med., Leipz., 1906, LXXXVII, 276-285, also, Methoden der Herzuntersuchung. Deutsche Klin., Berl. u. Wien, 1906, IV, 453-532.

[5] Cf. Potain, Les bruits de galop, Semaine méd., Par., 1900, XX, 175; Müller (F.), Ueber dem Galloprhythmus des Herzens, Münch. med. Wchnschr., 1906, LIII, 786; Robinson (G. C.), Gallop rhythm of the heart, Bull. Ayer Clin. Lab., Phila., 1908, 72.

have shown that a protodiastolic sound is so common in normal individuals, especially during adolescence, that it may fairly be called the "third sound" of the heart.[6] The position of this sound is well shown in the electrophonogram (Fig. 2). The suggestion that this sound is produced by the sudden closure of the atrio-ventricular valve-cusps, owing to their floating atrialward upon the blood accumulating between the cusps and the ventricular wall,[7] seems plausible.

As to the investigation of actual "heart murmurs" as distinguished from the so-called "heart sounds," it may be noted that in addition to the determination of the presence or absence of murmurs over the sites of auscultatory election for the various heart valves and of the position of such murmurs in time (systolic or diastolic) in the cardiac cycle, something can be gained by a study of the *punctum maximum* of a given murmur and the direction in which the murmur is best propagated therefrom; certainly the recognition of the transmission of certain aortic diastolic murmurs along the left margin of the heart to the apex and to the axillary region is of help in diagnosis (Cole's murmur).[8] Further, the quality of the sound of the murmur may in itself be practically pathognomonic, even when the murmur may be difficult otherwise to time; thus I am sure that you will agree with me that the

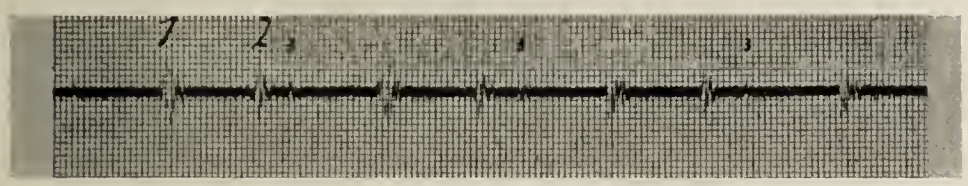


Fig. 2.—Electrophonogram of the heart sounds, showing the third as well as the first and second sounds (after Einthoven).

musical, rushing diastolic murmurs of aortic insufficiency are very characteristic in quality as are the diastolic and presystolic rumbling murmurs of mitral stenosis.

The most remarkable of the newer work on determining the form, position and movements of the heart as a whole, of its different chambers and of the great vessels entering and leaving it is that consisting of the application of the X-ray apparatus to the problem involved. Most useful here is the simple fluoroscopic examination (*roentgenoscopy*); *i. e.*, the observation of the parts as seen upon the fluorescent screen, for here the moving objects can be directly seen.[9] For the study of certain finer details and especially for the making of permanent records, it is sometimes desirable to take X-ray photographs (*roentgenography*), but as a rule these can be dispensed with.

Once one has grown familiar with the normal fluoroscopic appearances of the heart and great vessels as seen on sagittal, frontal and oblique trans-illumination, a study of pathological cases by these roentgenoscopic methods becomes very rewarding.

On sagittal trans-illumination the rays may be thrown in from behind and the fluorescent screen be placed in front (dorso-ventral direction), or the opposite course may be followed (ventro-dorsal direction). The appearances are somewhat different in the two instances, even when the tube is held at the same horizontal level, owing, of course, to the relative positions of the various organs to the ventral and dorsal walls of the thorax.

On sagittal dorso-ventral trans-illumination, with the tube held at the level of the fifth thoracic spine, the heart and the great vessels (together with the sternum and the spine) yield a large, shaded median stripe between the triangular, pale, rib-shaded areas of the two lungs, the whole picture being bounded below by the shadows due to the diaphragm (Fig. 3). This median stripe is narrower above than it is below and presents characteristic boundary lines. On the right the line is only slightly curved, though it can be seen to consist

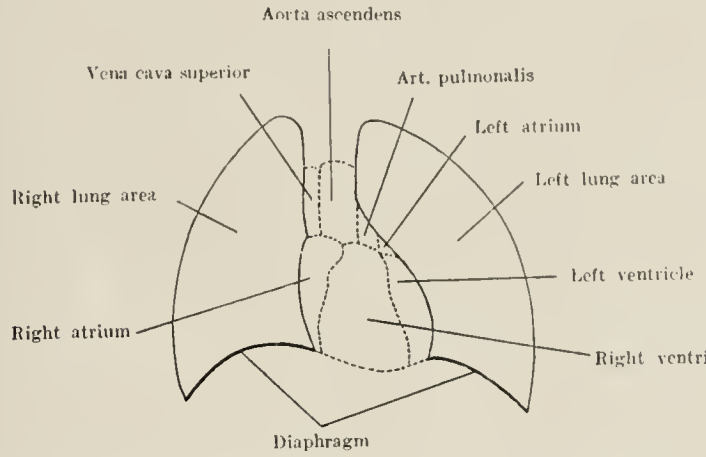


Fig. 3.—Schematic representation of the roentgenoscopic view of the thorax on dorso-ventral sagittal transillumination (after Brugsch and Schittenhelm).

of two parts; the upper part (above the third rib) corresponds to the right margin of the vena cava superior, the lower part (below the third rib) represents the right atrium. On the left side the outline of this cardio-vascular stripe presents three arcs, an upper, middle and lower curve. The upper left curve (I) extends between the first and second ribs and is formed by the arch of the aorta; the middle left curve (II) is rather flatter, extends between the second and third rib-levels and is due in its upper part to the pulmonary artery, in its lower part to the left atrium; and the lower left curve (III), the longest of the three, extending downward and lateralward from the level of the third to that of the seventh rib, corresponds to the left margin of the left ventricle.[10] The lateral boundary lines of the cardio-vascular stripe are very similar on ventro-dorsal trans-illumination, but the whole shadow is somewhat broader on account of the greater proximity of the heart to the anti-cathode and the consequent enlargement of the projection of the heart from divergent rays (Fig. 4).

[6] Thayer (W. S.), On the earlier diastolic heart sound, the so-called third heart sound. Bost. M. & S. J., 1908, CLVIII, 713.

[7] Hirschfelder (A. D.), Some variations in the form of the venous pulse, Johns Hopkins Hosp. Bull., Balto., 1907, XVIII, 265.

[8] Cole (R. I.) and Cecil (A. B.), The axillary diastolic murmur in aortic insufficiency, Johns Hopkins Hosp. Bull., XIX, 1908, 353.

[9] We are helped constantly in our diagnoses in the medical clinic in Baltimore by Dr. F. H. Baetjer, who has charge of the X-ray work at the Johns Hopkins Hospital.

[10] Weinberger, Weitere Beiträge zur Radiographie der Brustorgane, Med. Klin., Berl., 1908.

A wholly different view of the thorax is gained on frontal trans-illumination, when the patient holds his arms above his head and the tube is placed in one axillary line, the fluorescent screen in the other, both tube and screen being held parallel to the median plane of the body. This method is applicable only to people who are not too large or too obese, and the best view is obtained on deep inspiration. In this view (Fig. 5) two rather small, lighter areas due to the lungs appear, (*a*) one ventralward, triangular in shape, the so-called "retrosternal area" and (*b*) one dorsalward, behind the heart and above the diaphragm, the so-called "retrocardial area."

The dark area between these two light areas is due to the

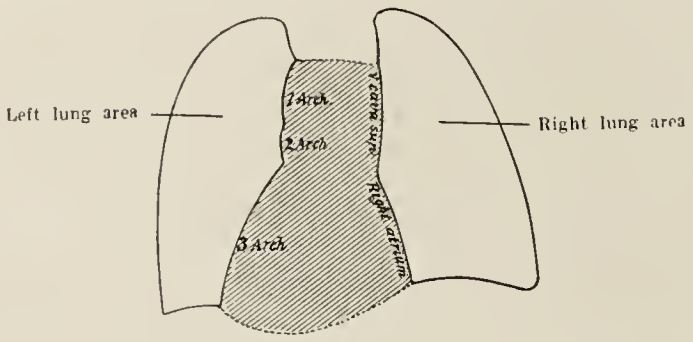


FIG. 4.—Cardio-vascular shadow as seen on ventro-dorsal sagittal transillumination, schematic (after Brugsch and Schittenhelm).

heart, the part of it forming the lower boundary of the retrosternal area being due to the right atrium, the conus arteriosus of the right ventricle and the ascending portion of the arch of the aorta. Between the retrocardial area and the spine, from the level of the seventh vertebra downward, are situated the œsophagus and the descending aorta. This frontal view of the thorax yields important information concerning (1) the ventro-dorsal diameter of the heart and (2) the presence or absence of aneurysmal dilatations of the ascending and descending aorta.

Since the working out of the sagittal and the frontal views

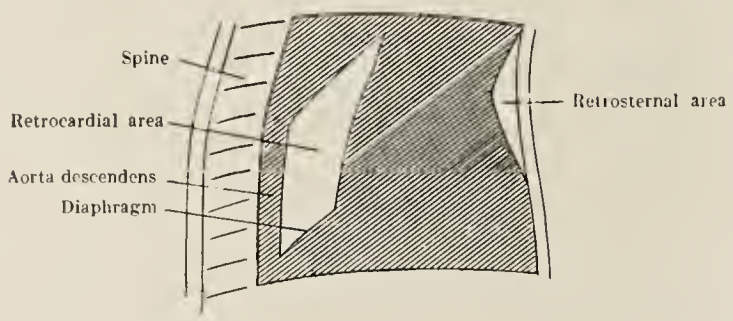


FIG. 5.—Frontal transillumination of thorax, schematic (after Brugsch and Schittenhelm).

of the thorax by roentgenoscopy, a still further application has been made through studies by trans-illumination in oblique directions. Four main directions are utilized by Holzknecht, whose work in this field has been especially important; (1) with tube behind the left shoulder and the screen on the front of the right chest, (2) with tube on right chest and screen behind left shoulder, (3) tube on right shoulder, screen on front of left chest, and (4) tube on front of left chest and screen on right shoulder. Of these four oblique directions by far the most important for the study of the heart and the aorta is the first. The normal thorax viewed in this first oblique direction presents three light areas due to lung substance, one on the left, one in the middle and one on the right (Fig. 6). The right and middle lung areas are separated from one another by the shadow of the spine, and the middle and left lung-areas are separated from one another by the cardio-vascular shadow. This latter shadow here has the shape of the front part of a shoe-maker's last (with high instep), the long tapering projection above corresponding to the ascending aorta and the aortic arch. The three clear areas are bounded below by the diaphragm. The œsophagus which runs in the middle clear area ordinarily throws no shadow, but comes out distinctly on passing a metal sound or a tube filled with mercury or bismuth. In aneurysm of the aorta the findings on oblique trans-illumination in this dorso-ventral sinistrodextral direction are especially important. Instead of the narrow upper end of the cardio-vascular stripe one sees a knob-like terminal projection which often encroaches upon the middle clear lung-area, even obliterating it sometimes in its upper part. An obliteration of the lower part of the middle lung-area indicates a dilatation of the atria of the heart.

On fluoroscopic examination several typical shapes of the

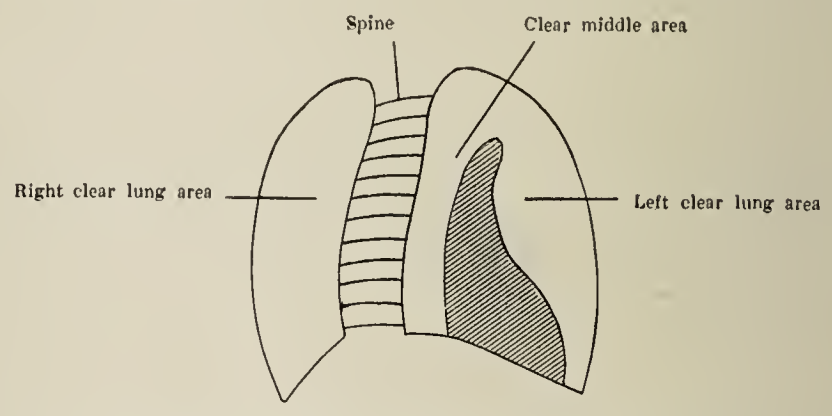


FIG. 6.—Thorax in oblique transillumination, lamp behind the left shoulder, screen in front of right chest, schematic (after Brugsch and Schittenhelm).

cardio-vascular stripe can easily be recognized. Among these types may be mentioned (1) the so-called "drop heart" (*cœur de goutte* of the French; *Tropfenherz* of the Germans), (2) the senile heart, (3) the type of the enlarged left ventricle, (4) the type of "mitral configuration," (5) the generally dilated heart, (6) the dilated heart in mitral stenosis with tricuspid insufficiency, and (7) the type of pericardial effusion.

In the *drop heart* it is the median position of the stripe, the narrowness of the stripe, the small area in contact with the diaphragm, the lateral mobility of the stripe on change of position, the high level of the base of the heart and the exaggeration of the second left lateral curve which are characteristic (Fig. 7).

In the *senile heart,* due to the loss of elasticity and elongation of the aorta, the heart is more transverse than normal (Fig. 8).

In the third type mentioned, due to *hypertrophy of the left ventricle,* the heart also lies more transversely. The lower of the three curves of the left border of the cardio-vascular stripe forms a projection which has been compared to a sheep's nose and the heart's apex is plump and rounded (Fig. 9).

In the *heart of "mitral configuration"* (Holzknecht) there is marked exaggeration of the lower curve on the right due to enlargement of the right ventricle and a characteristic bulging in the region of the middle curve on the left due to enlargement of the left atrium and dilatation of the pulmonary artery (Fig. 10). Where there is aortic insufficiency the second curve may be less marked than normal (Baetjer).

In the *uniformly dilated heart* the cardio-vascular stripe is broader than normal and the widening of the vascular area is especially noticeable owing to dilatation of the vena cava superior (Fig. 11).

The heart assumes a peculiar shape in *mitral stenosis accompanied by tricuspid insufficiency.* Here in addition to the characters of the heart of mitral configuration (*vide supra*)



Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.

Fig. 7.—The "drop-heart" on dorso-ventral illumination, schematic (after Brugsch and Schittenhelm).

Fig. 8.—The senile heart on ventro-dorsal illumination, schematic (after Brugsch and Schittenhelm).

Fig. 9.—Enlargement of left ventricle on dorso-ventral illumination, schematic (after Brugsch and Schittenhelm).

Fig. 10.—The mitral configuration of the heart of Holzknecht, dorso-ventral illumination, schematic (after Brugsch and Schittenhelm).

the effects of the great enlargement of the right ventricle and right atrium are visible and the cardio-vascular shadow occupies a more median position in the thorax (Fig. 12).

When the *pericardial sac is filled with fluid* the normal curves deliminating the cardio-vascular stripe laterally are obliterated and one sees the straight sides of a dark triangular shadow (Fig. 13).



Fig. 11.

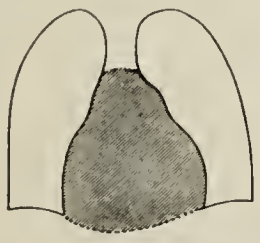


Fig. 12.

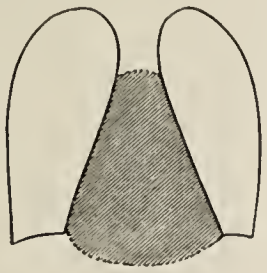


Fig. 13.

Fig. 11.—The generally dilated heart, dorso-ventral illumination (after Brugsch and Schittenhelm).

Fig. 12.—Dilatation of the heart in mitral stenosis and relative tricuspid insufficiency, dorso-ventral illumination, schematic (after Brugsch and Schittenhelm).

Fig. 13.—The shadow in pericardial effusion, dorso-ventral illumination (after Brugsch and Schittenhelm).

Besides the important information afforded concerning the form and position of the cardio-vascular shadow, roentgenoscopy also yields us interesting data regarding the movements and pulsations of the great vessels and the several heart chambers. With each systole of the normal heart one can see a shrinking in the region of the lower left lateral curve (contraction of the left ventricle) and often a bulging of the upper left lateral curve (expansion of the aorta). Occasionally systolic expansion of the middle curve on the left can be made out (pulmonary artery in patent ductus Botalli and occasionally in mitral disease). In tricuspid insufficiency it is sometimes possible to see a systolic expansion of the lower right curve due to reflux of blood into the right atrium on ventricular systole. Ventricular extrasystoles can also be observed fluoroscopically. The beginner should practice on bradycardiae patients as the longer interval between systoles makes the observation easier.

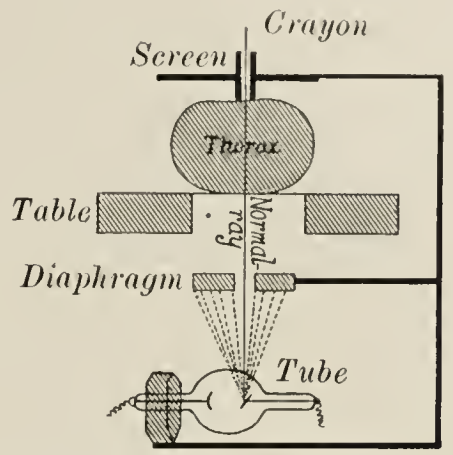


Fig. 14.—Schematic representation of orthodiagraph in cross-section.

Another method of which much is heard nowadays is the *orthodiagraphic study of the heart.* In it the attempt is made to determine very accurately the exact size of the heart by obtaining by successive orthogonal projection a number of single points in the outline yielded by X-rays falling perpendicularly upon the fluorescent screen, all divergent rays being cut by a diaphragm. Very ingenious apparatus for the purpose has been devised by Moritz (Fig. 14), the father of the method, and later by other workers, the best instrument at present

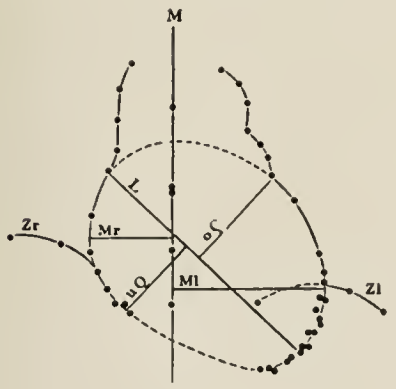


Fig. 15.

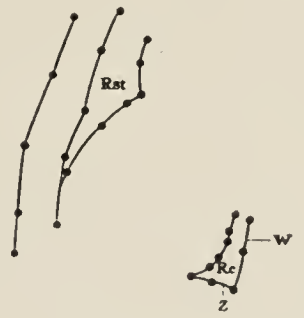


Fig. 16.

Fig. 15.—Sagittal orthodiagram (after Moritz).

Fig. 16.—Frontal orthodiagram (after Moritz).

perhaps being Groedel's modification of the Levy-Dohrn vertical orthodiagraph. The Kny-Schirer instrument, less expensive, may also be recommended. The lines joining the points obtained form a figure called the *orthodiagram* (Figs. 15 and 16). Certain distances on these orthodiagrams are measured and the results compared with normal values. The method is valuable for research work; the results exceed in accuracy those of any other method yet invented, but for practical clinical work we can get along very well without orthodiagraphy

provided we utilize the other forms of roentgenoscopy to the full.[11]

Very distinct progress has been made in the last decade in the clinical study of the arterial and venous pulse and of the apex beat, and much of this progress has undoubtedly been due to the greater vogue of the instruments of precision for *sphygmography* and *cardiography*. The distinguished French investigator, Marey, long ago demonstrated the value of graphic methods in the study of the circulation and it is rather surprising that clinicians were so slow in generally applying the methods to which he pointed the way. Nowadays, however, internists show much zeal in the study of *cardiograms, arteriograms,*[12] and *phlebograms* as the tracings from the heart, the arteries and the veins are called; the uses of Mackenzie's polygraph (Fig. 17) and Jacquet's cardiosphygmograph (Fig. 18) are explained to students in the medical colleges, and in some schools these instruments are used by the students themselves in the study of patients in the hospital wards. In learning to apply these graphic methods, the older methods of palpation of the radial pulse and of inspection of the jugular pulsations have not lost but rather gained ground. Just as the surgeon accustomed to the refinements of the modern hospital

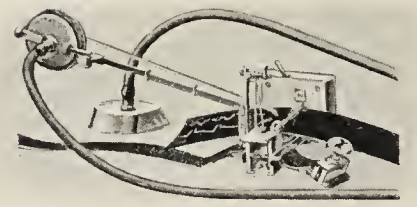


Fig. 17.

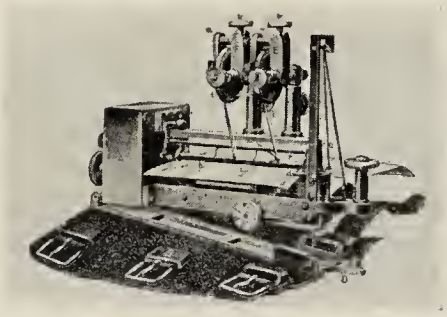


Fig. 18.

Fig. 17.—Polygraph of Mackenzie.
Fig. 18.—Jaquet's cardiosphygmograph.

operating-room will on occasion improvise better in the kitchen of a farm-house than the surgeon who has never known the more perfect technique, so the internist accustomed to analyze tracings obtained by the cardiosphygmograph is, when forced to observe without the aid of the instrument, better able to discriminate differences with the naked eye and the palpating finger than he who has never subjected the evidence of his naked senses to the control of these instruments of precision. Simple palpation of the arterial pulse is ordinarily sufficient for observations on frequency, volume and celerity, and for thickening of the arterial wall, but simple inspection and palpation of the jugular veins is very misleading, and it is here especially that the mechanically recorded tracing helps out the eye.

Of all the graphic tracings, that which has been most overestimated is the radial sphygmogram. So worthless and misleading are most radial sphygmograms that it is almost a wonder, considering the extent in which radial sphygmography has been practiced to the exclusion of other methods of graphic registration that the whole graphic technique has not been brought into disrepute thereby. In the medical clinic in Baltimore we discourage radial sphygmography and try to encourage instead the simultaneous recording of the pulses in the left carotid artery and the right jugular vein since these tracings yield us the sphygmographic information which is really of value to us in most cases.[13] The study of the carotid pulse gives us clues as to the activity of the left ventricle, the integrity of the aortic semilunar valves, and to a certain extent, the peripheral resistance to flow. The study of the jugular phlebogram gives us information regarding the pressure-conditions in the jugular vein and the right atrium and permits us to draw inferences regarding (1) the state of the tricuspid valve, and (2) the activity of the right atrium.

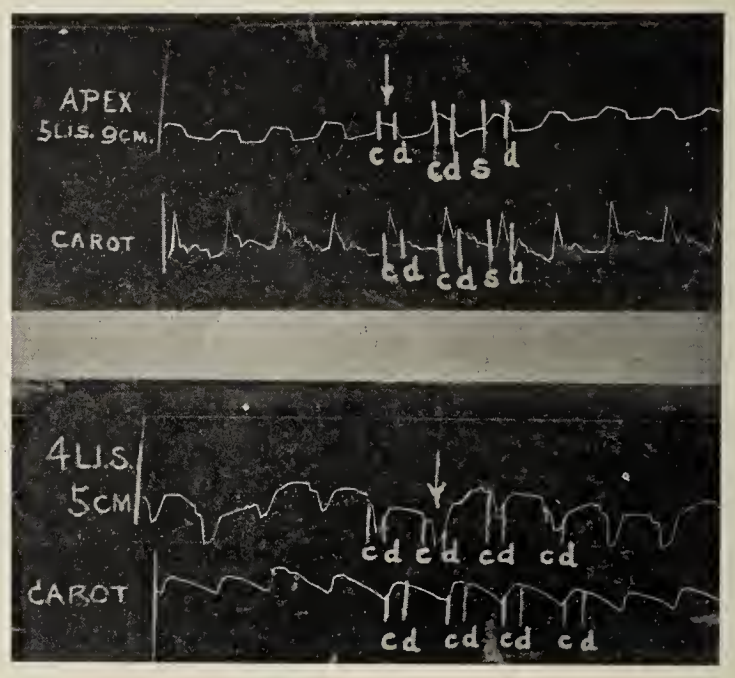


Fig. 19.—Comparison of cardiograms from left and right ventricles, upper tracing from left, lower tracing from right. Arteriograms for comparison (tracing by Dr. Hirschfelder).

The *cardiogram* is the most difficult of all graphic tracings to interpret, partly on account of the elevations on the curve due to the fling of the recording apparatus itself, partly on ac-

[11] In this connection the reader may consult the following sources: Baetjer (F. H.), The X-ray diagnosis of thoracic aneurisms, Johns Hopkins Hosp. Bull., Balto., 1906, XVII, 24-27; also, Further observations upon thoracic aneurisms, Compt. rend., IV Congr. internat. d'électrol. et de radiol. méd., 1908; Williams (F. H.), The Roentgen ray in medicine and surgery; Arthur and Muir, Practical X-ray work; Holland, X-ray examinations of the thorax, Liverpool Med.-Chir. J., 1908; Walsham, The X-rays in the diagnosis of diseases of the chest, Arch. Roentg. Ray., XIII; Holzknecht (G.), Die roentgenologische Diagnostik der Erkrankungen der Brusteingeweide, Hamburg, 1901, 1-229; Moritz (F.), Zur Geschichte und Technik der Orthodiagraphie, Münch. med. Wchnschr., 1908; Weinberger, Weitere Beiträge zur Radiographie der Brustorgane, Med. Klin., Berl., 1908; Albers-Schoenberg, Die Bestimmung der Herzgrösse mit besonderer Berücksichtigung der Orthodiagraphie. Fortschr. a. d. Geb. d. Roentgenstrahlen, 1908. A good epitome of the most important parts will be found in Brugsch u. Schittenhelm's Lehrbuch d. klin. Untersuchungsmethoden, Berlin, 1908.

[12] I have taken the liberty of introducing the term "arteriogram" as a brief word to take the place of "arterial sphygmogram." The word "phlebogram" has already been extensively used.

[13] It is a pleasure to express my thanks to Dr. Arthur Hirschfelder, associate in the Medical Clinic for untiring help in the making and interpreting of tracings.

count of the complexity of factors in the thorax upon which the curve depends (Fig. 19). Critically scrutinized, however, cardiograms afford information of value regarding the contractions of the left ventricle, of the right ventricle and sometimes, also, of the atria. When it is remembered further that tracings made of the variations in pressure in an œsophageal tube may yield information regarding the systole and diastole of the left atrium (Minkowski) it will be seen that clinicians are bet-



Fig. 20.—Carotid arteriogram (lower tracing) with cardiogram (upper tracing) for comparison. (*c*) Time of beginning of anacrotic limb of arteriogram. (*d*) Time of dicrotic notch (personal observation).

ter able now than ever before to secure data regarding the simultaneous conditions in all four chambers of the heart. With the aid of Jacquet's chronograph each event in a tracing can be exactly timed and compared with events in the other tracings simultaneously taken.

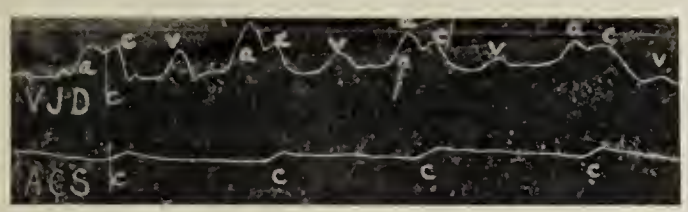


Fig. 21.—Normal phlebogram (*V*, *J*, *D*) from the right jugular vein with left carotid arteriogram (*A*, *C*, *S*) for comparison. (*a*) Presystolic wave. (*c*) Protosystolic wave. (*v*) So-called stagnation wave (tracing by Dr. Hirschfelder).

In the *arteriogram* we time the beginning of the ascending or anacrotic limb and that of the descending or catacrotic limb of the main wave and note especially the beginning of the dicrotic wave which times the closure of the aortic semi-lunar valves. We get a close approximation to the expulsion-period of the ventricular systole (efflux) by measuring the time elapsing between the beginning of the anacrotic limb and the beginning of the dicrotic elevation (Fig. 20).

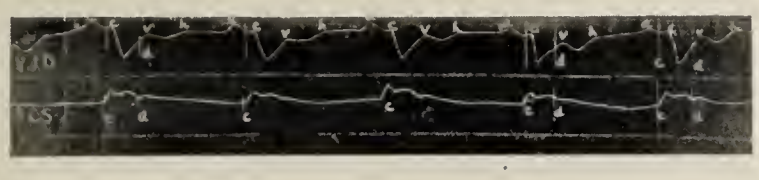


Fig. 22.—Phlebogram from a patient with bradycardia, showing *h* wave (personal observation).

In the normal *phlebogram* we distinguish, and time the occurrence of, three main waves, one presystolic, the so-called *a*-wave, due to the atrial systole, a second protosystolic, the so-called *c*-wave, coincident with the carotid pulse and due either to it or to the increase in pressure in the right atrium and jugular vein from shoving up of the atrio-ventricular septum at the time of the systole of the ventricle, and a third wave, the so-called *v*-wave (sometimes telesystolic, sometimes protodiastolic in time) the cause of which has been much in dispute (Fig. 21). The discussion of the other waves seen upon the phlebogram, especially (*h*-wave, *w*-wave, etc.) in bradycardia (Fig. 22), cannot be entered into here. We note that the main elevations in the normal venous pulse are diastolic-presystolic in time, and that the vein undergoes a marked systolic collapse, hence the term "negative" as applied to the physiological venous pulse.



Fig. 23.—Phlebogram from a patient suffering from paralysis of the right atrium. Drum moving rapidly. Disappearance of *a*-wave. Arteriogram for comparison (personal observation).

In marked contrast with the normal phlebogram are the tracings obtained (1) when the atrium is paralyzed, and (2) when the tricuspid valve is insufficient. In *atrial paralysis* the *a*-wave no longer appears, though the *c*-wave and the *v*-wave may still be pronounced (Fig. 23); the condition is usually a part of a pulsus irregularis perpetuus, to be returned to



Fig. 24.—Phlebogram and arteriogram from a case of tricuspid insufficiency, showing well-marked positive or ventricular venous pulse (personal observation).

in a moment. In *tricuspid regurgitation* the normal *a*-, *c*- and *v*-waves may all disappear, and the force of the contraction of the right ventricle sends a huge wave, systolic in time, into the right atrium and the jugular vein, giving rise to the so-called "positive" or "ventricular" venous pulse (Figs. 24 and 25).

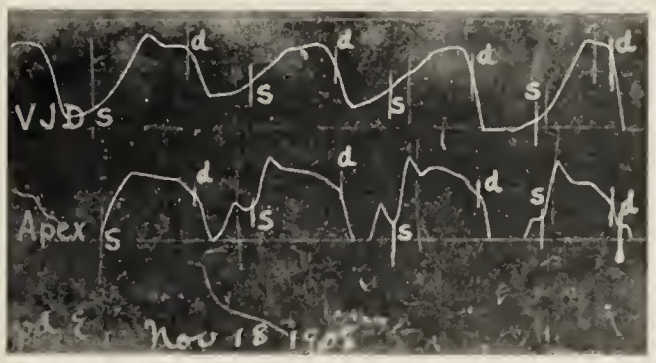


Fig. 25.—Phlebogram in another case of tricuspid insufficiency with cardiogram for comparison (personal observation).

A comparative study of the phlebogram with the arteriogram and cardiogram has proven to be of the greatest help in the clinical analysis of the different varieties of irregular pulse; it is only since such studies, combined with animal experimentation, were undertaken by Marey, Francois Franck, Gaskell, Engelmann, Wenkebach, Hering, Mackenzie, the

younger His and others that the different origins of these cardiac arhythmias have begun to be understood.[14] Through such studies much is being learned about the stimulus-producing (or chronotropic) function, the contractility (or inotropic function), the irritability (or bathmotropic function) and the conductibility (or dromotropic function) of the heart muscle.

Four or five great groups of cardiac irregularities may be distinguished from one another. In the first group the irregularity arises through *neurogenic disturbances of the chrono-*

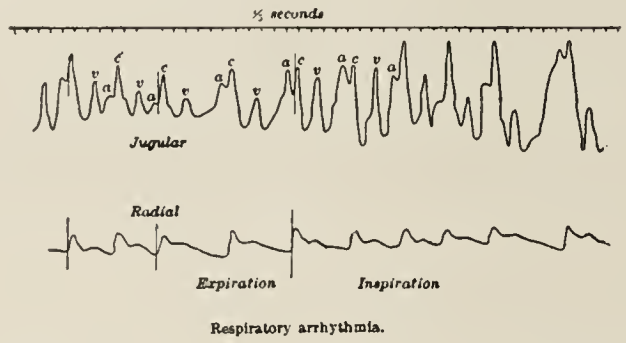


Fig. 26.—Phlebogram and arteriogram in pulsus irregularis respiratorius (after Hewlett).

tropic function. As an example may be cited the pulsus irregularis respiratorius in which the pulse becomes smaller and more frequent on inspiration and larger and slower on expiration due to vagal influence on the timer of the heart (Fig. 26). Here, too, belongs Mackenzie's "youthful type" of irregularity (Fig. 27). Such neurogenic irregularities can be made to disappear by the administration of atropin. A second group of irregularities includes those due to diminished power

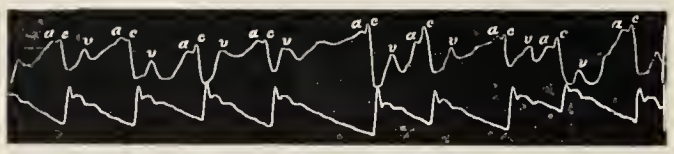


Fig. 27.—Phlebogram and arteriogram in the youthful type of irregularity (after Mackenzie).

of contractility (*negative inotropic disturbance*). As a paradigm may be mentioned the so-called pulsus alternans in which a stronger and a feebler pulse regularly alternates as a result of alternate strength and weakness in ventricular systole; the pulse, though regular in rhythm, is irregular in force (Fig. 28). Such a pulse is usually an indication of exhausted contractility of the heart muscle and is an urgent sign of need of rest.

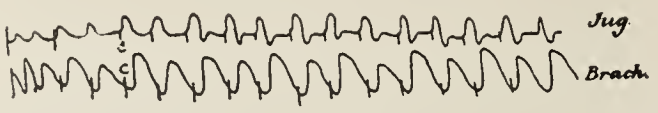


Fig. 28.—Pulsus alternans in paroxysmal tachycardia with ventricular venous pulse (after Hirschfelder).

A third great group includes the irregularities due to *extra systoles.* These extra beats may be due either to the presence of abnormal stimuli affecting the heart muscle or to an abnormal increase in irritability permitting stimuli normally infra-

[14] In America careful studies of this sort have been made by Morrow, Erlanger, Thayer, Hirschfelder, Schmoll, Hewlett, James, Dock, Cushing and Grosch, Cooper, Harris, Robinson, Piersol, Bachman and others.

liminal to become supraliminal. When such an extra systole originates in the ventricle or at the atrio-ventricular junction the next normal systole may be prevented, owing to the refractory phase due to the extra beat; the time elapsing be-

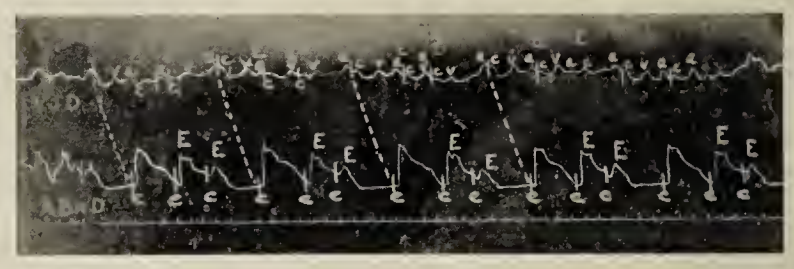


Fig. 29.—Atrial extra systoles (tracing by Dr. Hirschfelder).

tween the systole preceding the extra systole and that following it is exactly double that of a normal period (so-called "law of maintenance of physiological stimulus-periods"). This need not be true for extra systoles originating at the sinus or in the auricles. In order to decide whether an extra systole



Fig. 30.—Atrio-ventricular extra systoles. Jugular pulse. *Cb*, arterial pulse at wrist (after Hering and Rihl). I am personally inclined to regard these as atrial extra systoles similar to those in Fig. 29. It seems to me better to reserve, as Mackenzie does, the designation "atrio-ventricular extra systoles" for the extra beats in which both auricle and ventricle contract prematurely and simultaneously.

arises in the atrium (Fig. 29), in the His bundle (Fig. 30) or

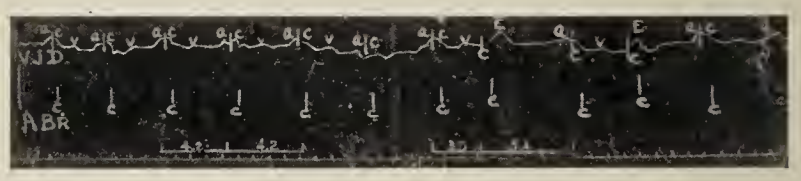


Fig. 31.—Ventricular extra systoles. Extra systole shown at *E*, no *a*-wave precedes (tracing by Dr. Hirschfelder).

in the ventricle (Fig. 31) one must study simultaneously registered phlebograms and arteriograms or analyze the photographically recorded electrocardiograms (*vide infra*).

The fourth group of cardiac arhythmias is due to disturbances of conductivity (so-called *dromotropic anomalies*) (Fig.



Fig. 32.—Arteriogram and phlebogram showing shortened conductivity (tracing by Dr. Hirschfelder).

32) and includes the conditions designated as *partial and total "heart-block."* While the sinus region, the atrium and the ventricle have (each for itself) their own inherent rhythm, the atrium and ventricle are subordinated in their activity nor-

mally to the action of the sinus region which is the true "timer" or "pace-maker" of the heart. When a rhythmical impulse originates in the sinus region it is conducted by the atrio-ventricular bundle of His and the Purkinje fibers to the musculature of the atria and the ventricles and there under normal conditions calls forth contractions which, though a little later in time, possess the sinus-periodicity. When conductibility in the His bundle is interfered with, instead of each atrial contraction being followed by a ventricular contraction, only every other one, every third one, or say every fifth one, is so followed ("two to one," "three to one" rhythm, etc.). One sees two, three or four *a*-waves on the jugular tracing to a single carotid pulsation. When conduction through the His bundle to the ventricle is completely hindered, the ventricle, ceasing to be subordinated in any way to the stimuli arising in the sinus region, begins to beat at its own inherent rhythmical rate of 12 to 30 beats per minute. When such a complete dissociation between the activities of the two ends of the heart exists we have the condition known clinically as the *Adams-Stokes syndrome,* a bradycardia associated with syncopal attacks. You will recall the important work of the younger His upon this subject and also Erlanger's brilliant

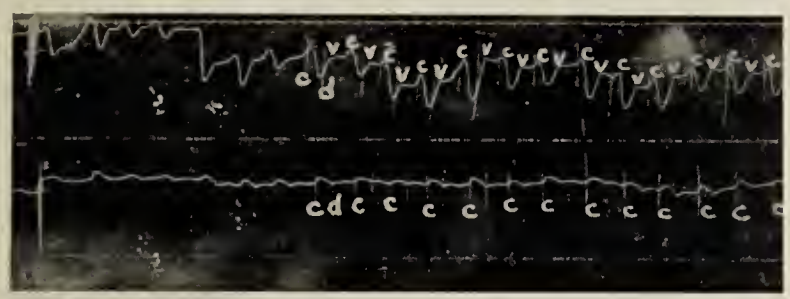


Fig. 33.—Pulsus irregularis perpetuus with atrial paralysis (personal observation).

experimental demonstration of the artificial productibility of all stages of partial heart-block up to complete heart-block in dogs by compression of the His bundle by a metal clamp.

Conditions of partial heart-block contraindicate the administration of digitalis preparations, since this drug acting even on the normal heart through the vagus can exert such a negative dromotropic effect of itself as to cause partial heart-block.

The so-called "pulsus irregularis perpetuus"[15] deserves a place by itself (Fig. 33). This peculiar irregularity, which, once begun, is usually permanent, remains about the same whether the heart beats fast or slow, and is independent of respiration. It is often met with in myocardial disease and in coronary sclerosis, and is usually associated with atrial paralysis (or at any rate, with atrial asthenia). It appears to be due to a disturbance in the primary source of stimuli, but is complicated by extra systoles[16] (Hering).

[15] This has been described by Mackenzie as abnormal inception of the cardiac rhythm. Though it is sometimes associated with tricuspid insufficiency Hewlett and others have shown that this is by no means always the case.

[16] The bibliography of the venous pulse and of the analysis of the cardiac arhythmias has become very large. The reader will find the following sufficient to direct him to the sources: Marey (E. J.), La circulation du sang à l'état physiologique et dans les maladies, Paris, 1881; Mackenzie (J.), The study of the pulse and movements of the heart, London, 1903; Wenkebach (K. L.), Zur Analyse des unregelmässigen Pulses, Ztschr. f. klin. Med., Berl., 1898, XXXVI, 181-199; 1899, XXXVII, 475-488; Dehio (K.), Ueber des Einfluss des Atropins auf die arhythmische Herzthätigkeit, Deutsches Arch. f. klin. Med., Leipz., 1893, LII, 97; Hirschfelder (A. D.), Graphic methods in the study of cardiac diseases, Am. J. M. Sc., Phila., 1906; Some variations in the form of the venous pulse, Johns Hopkins Hosp. Bull., Balto., 1907, XVIII, 265-267; Bard (J.), De l'enregistrement graphique du pouls veineux des jugulaires chez l'homme, J. de physiol. et de pathol. gen., Par., 1906, VIII, 454; Minkowski (O.), Zur Deutung des Herzarhythmien mittelst des oesophagealen Kardiograms, Ztschr. f. klin. Med., Berl., 1907, LXII, 371; Hewlett (A. W.), The common cardiac arhythmias and their clinical significance, Internat. Clin., Phila., 1907, 17 S., Vol. IV, 47-65; Hering (H. E.), Ueber den Pulsus irregularis perpetuus, Deutsches Arch. f. klin. Med., 1908, XCIV, 185-208.

Perhaps even more important for the general practitioner than the methods of analysis of the cardiac arhythmias are the simpler procedures now at our disposal for the study of the blood-pressure in the arteries and veins (*tonometry of the blood vessels*). For the determination of the maximal arterial pressure the simple Riva-Rocci instrument or some one of its various modifications is satisfactory. In order to ascertain the minimal arterial pressure one may use (1) T. C. Janeway's method[17] of watching the movement of the mercury in the manometer-tube as the pressure in the cuff of the Riva-Rocci apparatus is lowered to a point where the oscillations of the mercury-level are maximal (*oscillatory minimal pressure*), or (2) Strasburger's method[18] of palpation of the radial at the wrist, varying the pressure in the cuff on the arm until that pressure is found at which, and below which, the volume of the radial pulse is maximal (*palpatory minimal pressure*), or (3) Fellner's method (*auscultatory minimal pressure*).[19] The apparatus of von Recklinghausen[20] (Figs. 34 and 35) is useful for the clinical determination of both maximal and minimal arterial pressures, but it is expensive. By far the best apparatus, however, and the one to be used when accuracy of results is important, is that of Erlanger[21] (Fig. 36). One raises the pressure in the cuff until the pulse is obliterated and then gradually allows air to escape from the cuff recording the oscillations on the revolving drum; the point at which the oscillations abruptly increase in amplitude indicates

[17] Janeway (T. C.), The clinical study of the blood-pressure, N. Y., 1904, 313 p., 8°.

[18] Strasburger, Ein Verfahren zur Messung des diastolischen Blutdrucks, Ztschr. f. klin. Med., Berl., 1904, LIV, 373; also Ueber Blutdruck, Gefässtonus und Herzarbeit bei Wasserbädern, Deutsches Arch. f. klin. Med., Leipz., 1905, 459.

[19] Fellner (B.), Klinische Beobachtungen über Blutdruck, pulsatorische Druckzunahme, sowie ihre Beziehungen zur Pulskurve, Deutsches Arch. f. klin. Med., Leipz., 1905, LXXXIV, 407.

[20] Recklinghausen (H.), Ueber Blutdruckmessung beim Menschen, Arch. f. exper. Pathol. u. Pharmakol., Leipz., 1901, XLVI, 78; Unblutige Blutdruckmessung, Ibid., 1906, LV, 375-462.

[21] Erlanger (J.), A new instrument for determining the minimum and maximum blood-pressures in man, Johns Hopkins Hosp. Rep., Balto., 1904, XII, 53-110. Also the earlier article in Amer. J. Physiol., Bost., 1901, VI, 20-23.

the maximal pressure; continuing through the period when they are maximal, the oscillations will begin abruptly to decrease in amplitude, at the point when minimal pressure is reached. By noting the height of the mercury-column at these two points one has the maximal and minimal arterial pressures (Fig. 37).

Clinical ideas regarding the behavior of the blood-pressure have undergone a remarkable change since the advent of the

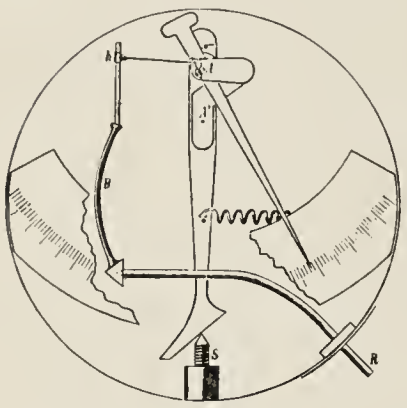


Fig. 34.

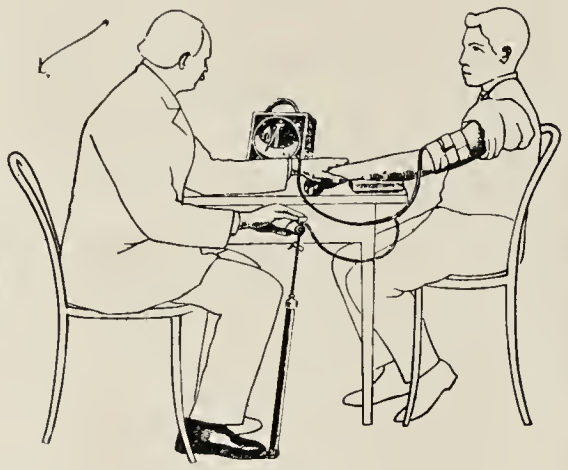


Fig. 35.

Fig. 34.—Tonometer of von Recklinghausen. *R*, tube connecting with cuff and air-pump; *B*, bourdon tube; *H*, shaft which can be moved up and down upon the rod attached to the bourdon tube; *F*, thread; *a*, axis of pointer; *A*, axis of frame; *S*, screw for rotating the frame.

Fig. 35.—Taking the blood-pressure on the upper arm with the von Recklinghausen instrument.

newer methods. While formerly it was the fall of blood-pressure which was supposed to be most important in cardiac pathology, we now know that pathologically low pressures are much more rarely met with than abnormally high pressures.

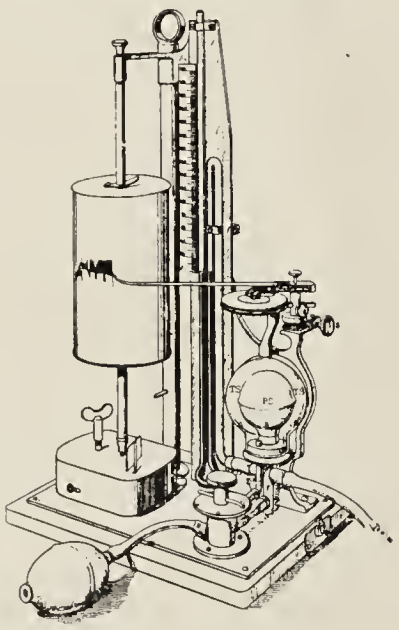


Fig. 36.—Erlanger's apparatus for determining maximal and minimal pressures.

Even in conditions of advanced valvular disease and of marked myocardial insufficiency the maximal arterial pressure may be very high. In many cases of arteriosclerosis (though not in all) *chronic arterial hypertension* is met with; it seems to be the cases of general arteriosclerosis which are most frequently associated with hypertension though doubtless a localized sclerosis of the cerebral, splanchnic or renal vessels may also be associated therewith. Especially where hypertension is associated with subjective feelings of dizziness, tinnitus and pressure in the head we should be on our guard to prevent an apoplexia cerebri. Most helpful in medical practice is the consideration of the maximal arterial pressure in relation to chronic diffuse nephritis. In early stages of renal contraction the arterial hypertension may be the first sign to draw our attention to the possibility of its existence. It is surprising to what a height the maximal pressure may go in chronic nephritis; as you know, the readings are often as high as from 220 to 280 mm. of mercury or even higher, the equivalent of a column of blood ten feet in height, and this at a time when other signs relied upon for the diagnosis of chronic nephritis may have only begun to appear.[22] Not every diffuse renal lesion leads to arterial hypertension; thus it is well known that in tuberculosis of the kidneys the pressure is not raised. Indeed I have come to look upon a *chronic arterial hypotension* as suggestive of a tuberculous focus somewhere in the body (adrenal tuberculosis; pulmonary tuberculosis; serous membrane tuberculosis or genital tuberculosis). In the albuminuria of adolescence the maximal pressure is often a guide in differential diagnosis; thus the so-called orthostatic albuminuria is not associated with hypertension, while the nephritides slowly developing after scarlet fever or tonsillar infections



Fig. 37.—Determination of maximal and minimal pressure by Erlanger's apparatus; maximal pressure at about 145, minimal at about 95; brachial arteriogram beneath (personal observation).

usually lead to a pathological heightening of the maximal pressure.

The clinical consciousness is now so fully alive to the advantages of a knowledge of the maximal arterial pressure that the Riva-Rocci type of instrument forms to-day a part of the instrumental armamentarium of most active general practitioners. The value of the determination of the minimal arterial pressure is, however, not yet so well understood, even in hospitals. When both maximal and minimal pressures have been determined we get by subtracting the one from the other the so-called *"pulse-pressure"* which normally amounts to about 30 mm. of mercury, but which may be much less or much more in pathological states. After administering digitalis one often hears a clinician state that the pulse has become much "better"; analysis shows that the improvement is due to an increase in the pulse-amplitude, and this corresponds to the pulse-pressure; the increase is, as a rule, owing not to a heightening of the maximal but rather to a lowering of the

[22] For a good discussion of this subject see Müller (F.), Der Ausbau der klinischen Untersuchungsmethoden, Ztschr. f. aerztliche Fortbildung, 1906, III. ——.

minimal pressure; this is chiefly due to a larger systolic output by the left ventricle and, sometimes, partially, to a decrease in the peripheral resistance.

Studies of this sort have inspired clinicians and physiologists with the hope that with the aid of these bloodless methods we may determine, at least approximately, the amount of work being done at any given time by the human heart, a problem the solution of which is of the utmost importance for functional diagnosis. Time will not permit me to enter upon a discussion of this topic, but I would refer those interested to the valuable articles of Erlanger and Hooker,[23] Strasburger, Dawson[24] and Sahli[25] bearing upon it. So many factors are concerned—the systolic output, the pulse-rate, the peripheral resistance and the velocity of the flow in the vessels—that the task becomes a very complicated one. Some help can be obtained by the use of the *phlethysmograph* of Mosso which gives us a curve (phlethysmogram) of the variations of the quantity of blood in an extremity ("volume-pulse").

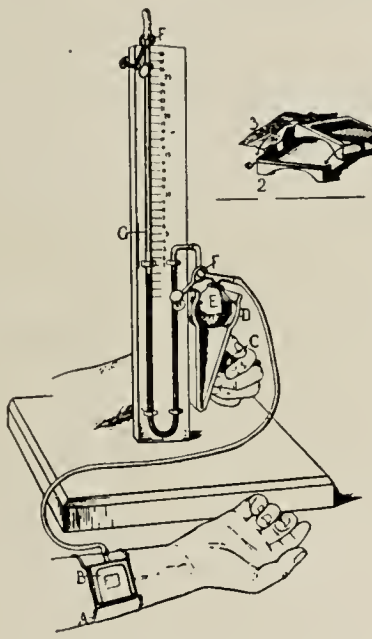


Fig. 38.—Apparatus of Hooker and Eyster for determining the venous pressure.

There is still another factor in the circulatory process which should not be overlooked in our clinical investigations; I refer to the pressure in the veins. Thanks to the simple apparatus devised by Hooker and Eyster[26] (Fig. 38) we can now easily measure the *venous pressure* in the clinic, and we may hope before long to have data derived from its application which will prove to be of service to us in diagnosis and prognosis and perhaps as a guide to therapy.

[23] Erlanger (J.) and Hooker (D. R.), An experimental study of blood-pressure and of pulse-pressure in man, Johns Hopkins Hosp. Rep., XII, 1904.

[24] Dawson (P. M.), Systolic output and work of the heart, and their relation to the blood-pressures, Brit. M. J., Lond., 1906, II, 996.

[25] Sahli (H.), Ueber das absolute Sphygmogramm und seine klinische Bedeutung nebst kritischen Bemerkungen über einige neuere sphygmomanometrische Arbeiten, Deutsches Arch. f. klin. Med., Leipz., 1904, LXXXI, 493.

[26] Hooker (D. R.) and Eyster (J. A. E.), An instrument for determining the venous pressure in man, Johns Hopkins Hosp. Bull., Balto., 1908, 274.

I must not close these remarks, already lengthy, without referring, if only very briefly, to the latest enrichment of our clinical methods of cardiac investigation, namely the technique of *electrocardiography*. Students of bioelectric phenomena have long known that in all parts of the body in which active changes go on, differences in electric potential arise which result in the passage of the so-called "action-currents" from points of higher to points of lower potential. Thus in the heart, the part at rest is positive as regards the part contracting; for example, when the atria contract an action-current arises on account of the differences in potential between the base of the heart and the apex. Later when the ventricles contract, there is an action-current in the opposite direction. Waller showed that these action-currents in the heart affect the potential of the tissues of the whole body (Fig. 39) and that it is possible by connecting electrodes with the moist skin to collect the currents and measure their strength by means of an electrometer or a galvanometer.[27] The best conditions for collecting these currents are afforded by placing the right hand and the left foot in solutions containing the metal elec-

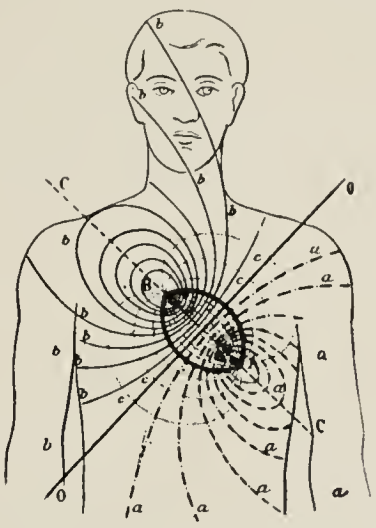


Fig. 39.—Distribution of cardiac electricity on the surface of the body (after Waller).

trodes, the former corresponding to the base of the heart, the latter to its apex. As the currents generated are extremely small their detection was so difficult that a clinical application seemed out of the question until the Dutch physiologist Einthoven[28] applied first the capillary electrometer and later devised his thread-galvanometer for the purpose. Electric currents passed through a magnetic field undergo, as is well known, a deflection which increases either with the strength of the current or the strength of the field. Einthoven passes the current from the heart through a microscopic thread (string) made of quartz or platinum, one to three microns in thickness, suspended in a very strong magnetic field; the movements of this thread are photographed through an illuminated slit on a rapidly moving film under a lens magnifying several hundred times. The photographic record yields a curve known as the

[27] Waller (A. D.), On the electromotive changes connected with the beat of the mammalian heart and of the human heart in particular, Phil. Trans. Roy. Soc., Lond., B., 1889, CLXXX, 169.

[28] Einthoven (W.), Ueber die Form des menschlichen Elektrokardiogramme, Pfluger's Arch., 1905, LX, 101; also, Le télécardiogramme, Arch. internat. de physiol., 1906, IV, 132.

electrocardiogram. An analysis of this curve taken from the normal heart (Fig. 40) shows five oscillations, *P, Q, R, S* and *T*, three of them being elevations (*P, R* and *T*) and two of them depressions (*Q* and *S*). The first elevation *P* corresponds to the contraction of the atria, the other movements represent the electromotive changes during the contraction of the ventricles. If two men hold hands one gets a composite curve of the bioelectric changes of the two hearts (Samoiloff); in the electrocardiogram from a pregnant woman two independent rhythms are distinguishable, one belonging to the mother, the other to the fœtus (Cremer);[29] it seems probable that in twin pregnancies three electrocardiograms will be distinguishable in the one tracing, though, as far as I know, the observation has not yet been made.

Once an electrocardiographic station is set up it may be used for making records not only from patients at the station itself but from patients at a distance, provided the connecting wires are available. Einthoven has connected his laboratory by wiring with the wards of the Leyden Hospital a mile and a half away and so is able to take the curves without moving very sick patients. The possibilities of such "telecardiograms"

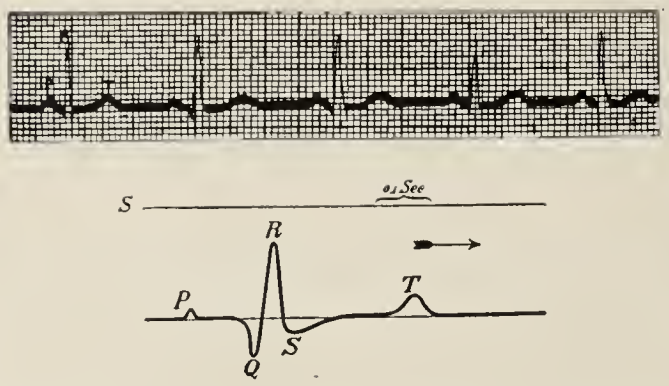


Fig. 40.—Normal electrocardiogram obtained by photographing the movements of a sensitive galvanometer. The upper figure shows the photographed curve, while the lower one is a diagram constructed from the photograph to make clearer the electrical changes in a single cardiac cycle. To obtain this record the electrodes were connected with the right and left hands. Waves with the apex upward indicate that the base of the heart (or the right ventricle) is negative to the apex (or left ventricle). Waves with the apex downward have the opposite significance. Wave *P* is due to the contraction of the auricle. Waves *Q*, *R*, *S*, and *T* occur during the systole of the ventricle. The curve seems to show that the contraction in the ventricles begins first toward the apex (or in the left ventricle), since the negativity first appears toward that side (wave *Q*). (Einthoven).

may make necessary only a moderate multiplication of electrocardiographic stations.

Though the method is still very new, the application to the study of clinical cases already made gives much encouragement for results from its further use. Particularly in the analysis of myocardial disturbances (organic and functional) a domain in which our clinical investigative methods have hitherto been singularly deficient, the electrocardiograph promises a good deal.

In situs inversus visceræ there has been shown to be an inversion of the electric potential (Waller); in mitral insufficiency with hypertrophy of the right ventricle, the elevation *R* may be greatly increased, while in aortic insufficiency with hypertrophy of the left ventricle, there may be, instead, a marked depression at *R*. In mitral stenosis with enlargement of the left atrium, the first elevation *P* on the electrocardiogram may be higher than normal, more prolonged and subdivided into three or four separate parts, while the elevation *T* is lower than normal. In studying

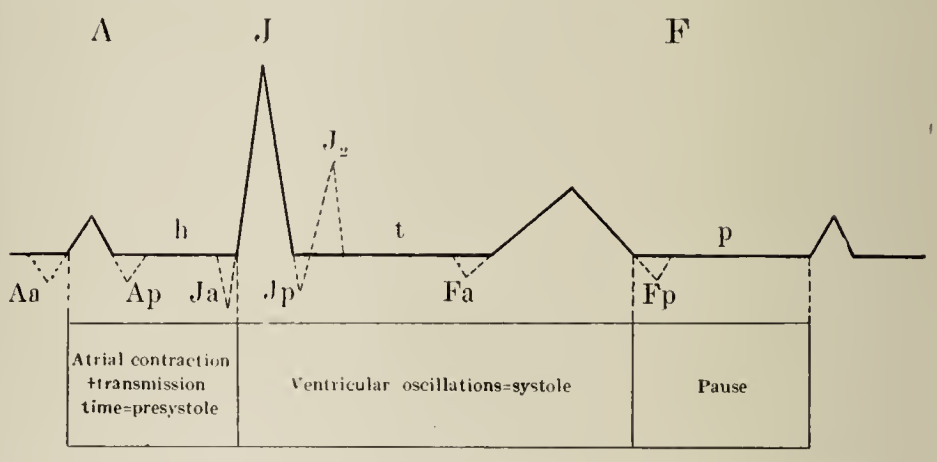


Fig. 41.—Analysis of electrocardiogram according to Nicolai.

the activities of the atria separate from those of the ventricles electrocardiograms are especially helpful; they permit of a very accurate measurement of the time of conduction of the motor impulse from the atrium to the ventricle, or at least of the time intervening between the beginning of the atrial and that of the ventricular contraction (*As-Vs* interval) and so are of value in the analysis of cases of heart-block and of extrasystolic irregularities.

A later analysis of the electrocardiogram than that by Einthoven has been made by Nicolai.[30] He pays especial attention to the three elevations *P, R* and *T* of Einthoven, but prefers to designate them *A, J* and *F* (Fig. 41), *A* being the atrial oscillation and *J* and *F* the main oscillations due to the ventricular activity, *J* corresponding to the initial and *F* to the final ventricular oscillation. The horizontal stretches of the

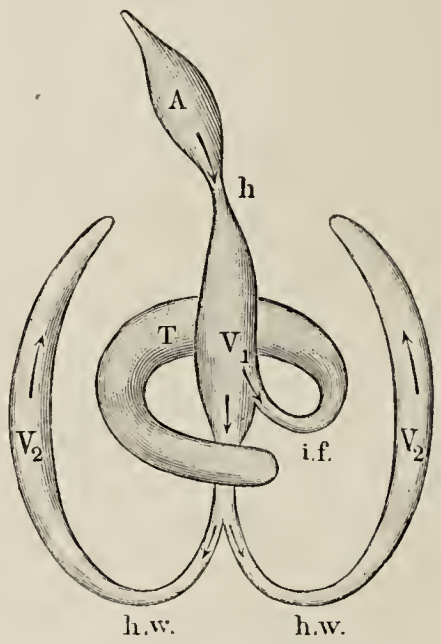


Fig. 42.—Scheme of the course of conduction in the cardiac muscle (after Nicolai).

[29] Cremer (J. M.), Ueber die directe Ableitung der Aktionsströme des menschlichen Herzens vom Oesophagus und über das Elektrokardiogramm des Foetus, Münch. med. Wchnschr., 1906, 811.

[30] Nicolai (G. F.), Die Mechanik des Kreislaufs in Nagel's Hdbch. d. Physiol. d. Menschen, 1909, I, 824-828.

electrocardiograms are labelled, *h*, *t* and *p*, indicating that the excitation is in the His bundle (*h*) or in the circular muscle or *Treibwerk* (*t*) (Fig. 42), or that no excitation exists during the pause (*p*). The less regular oscillations (usually in the reverse direction) occur just before or just after the main oscillations and are marked by an *a* or a *p* (anterior or posterior); this explains *Aa*, *Ap*, *Ja*, *Jp*, *Fa* and *Fp* of the diagram. Occasionally an oscillation is doubled (*e. g.*, J_2 of the diagram).



Fig. 43.—Forms of electrocardiogram obtained when there is lack of synchronism of the two ventricles. The first curve appears to correspond to the electrocardiogram of the right ventricle, the second to that of the left (after Kraus and Nicolai).

Nicolai believes that *A* corresponds precisely to the atrial contraction, that *h* indicates the passage of the excitation over the His bundle, the record being horizontal because the volume of muscle excited is so small; after this the basal part of the papillary system is active (*J*) and the impulse is propagated to the apex, by which time the elevation *J* is over. The oscillation *J* is abrupt and large, Nicolai thinks, not because

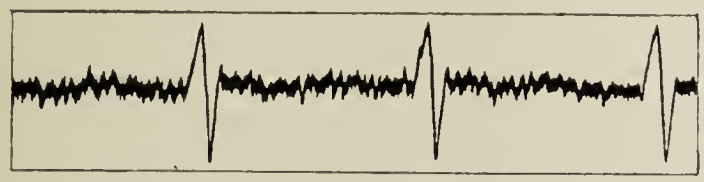


Fig 44.—Electrocardiogram in hypertrophy of the left ventricle (after Kraus and Nicolai).

of greater excitation or stronger contraction of the heart muscles at this time than later, but only because during this period the excitation is all of one kind and the differences in electric potentials are additive not subtractive. After this comes a time when the ventricles as a whole contract, perhaps without predominance of any one set of ventricular muscle fibers; the transverse fibers (*Treibwerk*) as well as the longitudinal (spiral) fibers are simultaneously active, the contrac-



Fig. 45.—Electrocardiogram with loss of *T* wave in myocardial disease (after Kraus and Nicolai).

tion beginning at the apex of the heart (base of the papillary muscles).

This synergistic action of muscle fibers at right angles to one another causes a diminution in the size of the cavity of the heart and the partial differences in electric potential of the different fibers neutralize one another, hence the straight line *t* of the electrocardiogram; or if during *t* the circular fibers are especially concerned in the contraction it is conceivable that the electrical equivalent of this predominance does not appear in the record, because of such equal diffusion of the differences in potential toward the two electrodes (on account of the anatomical position of the circular fibers) that it does not show itself in the electrical currents. The final ventricular oscillation *F* is an expression, Nicolai believes, of the arrival of the excitation at the base of the ventricles. Then all activity of the heart muscle ceases during the pause (*p*) until the next atrial contraction (*A*). This interpretation of the electrocardiogram accords well with the results of Braun's[31] cinematographic records of the movements of the heart, with Tawara's and Retzger's studies of the conduction system and

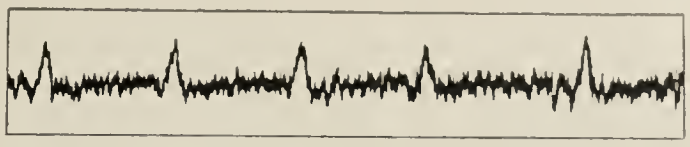


Fig. 46.—So-called splintering of the curve in myocardial disease (after Kraus and Nicolai).

with Rehfisch's[32] studies on the form of the heart during ventricular systole.

The application of the electrocardiograms to the analysis of the pulsus irregularis perpetuus has recently been made by H. E. Hering. His work indicates that the stimuli have their origin at the atrioventricular junction and that extra systoles play a rôle in the irregularity.[33]

Last year Kraus and Nicolai[34] published an article in which they assert that the two ventricles of the heart, though usually contracting synergically possess separate electrocardiograms. Normally these two electrocardiograms are superimposed and

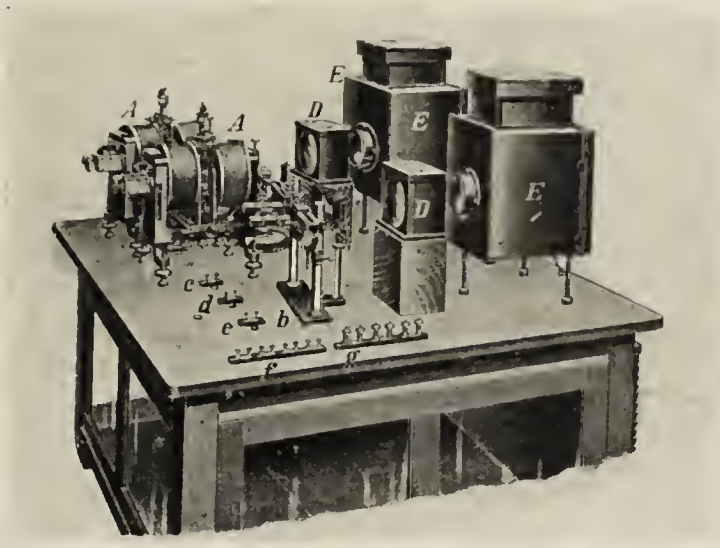


Fig. 47.—Galvanometric portion of an electrocardiographic station (after Edelmann).

yield what we know as the ordinary curve (*Q*, *R*, *S* and *T*); the contractions of the two ventricles are, however, sometimes

[31] Braun (L.), Ueber Herzbewegung und Herzstoss, Jena, Fischer, 1898.

[32] Rehfisch, Herzbewegung und Herzkontraktion, Berl. klin. Wchnschr., 1908, No. 26.

[33] Hering (H. E.), Das Elektro-Cardiogramm des Irregularis perpetuus, Deutsches Arch. f. klin. Med., Leipzig, 1908, XCIV, 205-208.

[34] Kraus (F.) u. Nicolai (G. F.), Ueber das Elektrokardiogramm unter normalen und pathologischen Verhältnissen, Berl. klin. Wchnschr., 1907, 765, 811; also, Ueber die funktionelle Solidarität der beiden Herzhälften, Deutsche med. Wchnschr., 1908, 1-5.

dissoeiated, (*a*) in animal experiment, and (*b*) in so-called hemisystole in human beings. Where there was eomplete dissociation they got the eurve of the right ventriele quite separate from that of the left (Fig. 43). In human hearts with hypertrophy of the left ventricle they obtained eurves in which the eleetrocardiograms of the left ventricle predominated in the complex (Fig. 44). In eertain forms of myoeardial degeneration a striking feature is the loss of the elevation *T* (Fig. 45); in other cases a marked "splintering" of the eurve appears (Fig. 46). These examples will be enough to demonstrate the faet that we have to deal in eleetroeardiography with a most important addition to our elinical methods of studying the heart. We are just installing one of Edelmann's [35] instruments in the medieal elinie at the Johns Hopkins Hospital and hope before long to be able to make personal observations with it (Fig. 47).

This task of summarizing, of, one might almost say, evisceerating a large subjeet in an hour's leeture, I have not found easy, and I fear I shall be held guilty of sins both of omission and eommission, but if I have been able to indieate even imperfeetly the trend of modern elinieal eardiae investigation it is, perhaps, all that one could hope to do in the time. The aims of our elinical work ehange, more or less, every few years. Old methods give plaee to new ones, and new "truth" is soon seen to be only partially true. Medieine is in a state of flux. A modern writer, referring to morality, has said that all human progress may be epitomized in the ery "The ideal is dead; long live the ideal!" Bearing in mind the ehange of elinieal interest whieh was formerly direeted so mueh to alteration in form, but now inclines rather to modifications of funetion, we might well exclaim, "The elinical aim is dead; long live the elinieal aim!"

[35] Edelmann, Jr. (M.), Ueber ein kompletes Instrumentarium zur Aufnahme von menschlichen Elektrokardiogrammen, München, 1908.

A SMALL EPIDEMIC OF JAUNDICE WITH SYMPTOMS OF GASTRO-INTESTINAL CATARRH.

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I. Introduction.

The oecurrence of jaundiee with fever and gastro-intestinal disturbances in a number of people at the same time is well known now even to the laity. As long as 19 years ago Hennig (1) analysed 86 epidemics of this sort in the literature; since then from 35 to 50 more have been added. Wm. Hunter (2), Rolleston (3), Quineke, Hoppe-Seyler (4), and Boggs (5) have all reviewed the subjeet extensively. Raymond (6), Lamphear, Brooks (7), Libman (8), and Satterlee (9) have reported instanees in this eountry. The elinical types have varied from a simple eatarrhal jaundiee with fever to the most severe forms of icterus with prostration, acute intoxieation, nephritis, destruetion of the liver, and death. Between the severer and the milder types stands the moderately severe form of infeetious jaundice with gastro-intestinal disturbanees, acholie stools, enlarged spleen, and nephritis, deseribed as early as 1864 by Griesinger as *typhus biliosus*. and reported by Weiss (10), Frölieh (11), Chauffard (12), Lürman (13), Kelsch (14), Hirseh (15), and Mathieu (16), in the years following, from 1864 to 1886. In 1886, Weil, (17), in Heidelberg, drew espeeial attention to this form of infeetious jaundice, and gave a very aeeurate deseription of the disease, whieh led the Germans to attaeh his name to the infection and to claim for it the dignity of a separate elinieal entity. The Freneh and English (notably Wm. Hunter) eonsider, however, that the syndrome may be included in the large group of *icterus infectiosus,* and maintain that the various members of this group differ from one another simply in severity.

The eondition is apparently not a septicæmia, but rather a loeal infeetion, either of the gastro-intestinal traet alone, or also of the bile passages and possibly sometimes of the liver. Our bacteriological knowledge of the disease depends upon examinations at a few autopsies, Weil (*l. c.*), Jäger (18), Haas (19), Wassilief (20), Brodowski and Dunin (21), Nauwerek (22), Brooks (*l. c.*), Lumbrera, and Neelsen (23), and upon studies of the stools, and is rather unsatisfaetory.

II. Clinical Findings.

The small epidemie whieh we desire to report oeurred in the Baltimore City Jail in November and Deeember of 1908, affeeting only six men out of 700 inmates. Three were white, three eolored. All were between 21 and 29 years of age.

Through the kindness of Dr. Geo. L. Wilkins, the jail physician, we were allowed to see these patients on December 13, and to examine them elinieally and baeteriologically. We desire to thank Dr. P. W. Clough and Messrs. Budd and Woltereek for helping us in the examinations.

The first patient (W.) to be taken ill eomplained of a "droopy feeling across the shoulders" on November 26, and

that night had a chill and an attack of vomiting. Headache was complained of next morning, and persisted for a week. During this time he suffered abdominal pain and pain in the calves of the legs and hips. The jaundice was not apparent until after the sixth day of the disease, and the stools then became acholic and frequent. There was anorexia from the first.

The anamneses in all six were quite similar. The second patient (W——h), though he was the last man of the six to be discovered ill, gave a history of onset, marked by soreness in the "stomach" and anorexia, occurring as early as December 1, five days after the first patient was attacked. On the eighth day his eyes were yellow and his stools acholic. His urine was dark in color. Epistaxis occurred on the fifteenth day.

L., Case No. 3, was taken ill seven days after No. 1, complaining of pains all over his body; these soon became intense. He vomited frequently on the third and fourth days, and nausea and hiccough persisted in the attack. The jaundice appeared on the seventh day of the disease. His nose bled several times.

K., No. 4, was attacked on the same day as L., No. 3, with a very similar onset, namely, headache and pains all over the body, though most marked in the legs. A chill followed during the night, and he suffered from several more rigors during the first three days. Besides anorexia and diarrhœa, he had five attacks of epistaxis. Jaundice appeared on the fifth day and the stools no longer contained bile.

D., No. 5, complained of headache, vomiting, pain in the knees and shoulders, nine days after the first patient was attacked. His vomiting continued, and on the eighth day the scleræ became yellow. The stools were acholic.

J., No. 6, vomited suddenly on December 9, four days after D., No. 5. Chill and headache followed, and his nose bled several times. The jaundice was noticed on the second day of his attack, and the stools quickly became clay colored.

In summary, the onset was sudden, with chill and headache in three cases; severe muscle pains were a feature of three. Nausea, vomiting, diarrhœa, and abdominal pain, occurred separately or in combination at one time or another in all the cases. The jaundice was obstructive in type appearing on the sixth, eighth, seventh, fifth, eighth, and second days, respectively.

A hæmorrhagic diathesis and other common accompaniments of icterus were present.

We examined all of the patients upon the 13th of December, and so saw each of them at a different stage in the disease. We made the following notes of our examinations on that day:

No. 1, eighteenth day of disease, was still jaundiced, although his stools contained bile. The liver dulness extended from the fourth rib to three fingers' breadth below the costal margin in the right mammillary line. The consistency of the edge was increased. The splenic dulness was somewhat increased. The temperature which on the seventh day had been 101° F. had remained normal after the ninth day.

No. 2, fifteenth day of the disease, was also jaundiced. The stools now contained bile. His tongue was heavily coated. The liver dulness reached the costal margin from the fourth rib; its edge was easily felt, thin and resistant. There was some tenderness in the epigastrium. The splenic dulness was increased to the anterior axillary line but the spleen was not palpable. There had been no fever since the patient first came under observation.

No. 3, eleventh day of the disease was the most acutely ill man of the six. He was still severely jaundiced and his stools acholic. On both lips were black blood-crusts, the remains of hemorrhagic herpes, and hemorrhage had occurred into a group of pustules behind the left ear. His nose bled during the examination. He still complained of muscular pain. There was no abdominal tenderness. The liver dulness reached from the fourth intercostal space to the costal margin in the right mammillary line. It descended one fingers' breadth below on inspiration and was thin and soft. The spleen was not felt, nor was the dulness demonstrably increased. His temperature, 104° F. on the third day, had fallen gradually to normal in three days.

No. 4, eleventh day of the disease also, was only slightly jaundiced. Bile was evidently entering the intestines. The liver extended from the fourth rib to the costal margin and was indistinctly palpable. The spleen was very easily felt. His temperature, remittent in type, 99° to 102° F., had reached normal on the tenth day of the disease.

No. 5 (eighth day), was slightly jaundiced, but his stools contained bile. The liver edge was soft, palpable at the costal margin, and the splenic dulness extended to the mid-axilla. His temperature was 100° F. when first recorded on the seventh day, and remained normal thereafter.

No. 6 (fifth day), showed jaundiced scleræ. His stools were brownish. The liver dulness extended from the fourth intercostal space to a level one finger's breadth below the costal margin in the right mammillary line. The edge was only indefinitely felt. The spleen was not palpable although the dulness reached the anterior axillary line. He had no fever after the first two days of the disease.

In a word all the patients showed jaundice, and its usual accompaniments. The pulse remained slow in all the cases. The liver was of normal size or was slightly enlarged and its consistency a little firm. The spleen was constantly enlarged.

The temperatures were, of course, not recorded until the patients were sent to the jail hospital, and only twice daily then. For this reason only two of the cases, L. and K., were observed fairly early in the febrile period, on the third and fifth days, respectively. L. had a continued high fever; K. a remittent type; in both the temperature fell by lysis. J. (observed first on the second day) either had little or no fever, or it was missed by the infrequent recording. The *leucocytes* counted upon December 13 were as follows:

No. 1, W.,	18th	day	of	disease	13,000
" 2, W—h,	15th	"	"	"	5,200
" 3, L.,	11th	"	"	"	23,200
" 4, K.,	11th	"	"	"	13,400
" 5, D.,	8th	"	"	"	10,400
" 6, J.,	5th	"	"	"	7,800

L., the sickest man, with the highest temperature, had the highest leucocytosis—23,200. W——h and J., with 5,200 and 7,800, respectively, showed no acute symptoms at that time.

Polymorphonuclear neutrophilic leucocytes predominated. No parasites were found or evidence thereof. The bile in the plasma was the only other thing noteworthy in the blood examinations. The red blood corpuscles were of good color,

and no pessary forms or varied shapes or sizes were observed. The specimens of urine obtained on December 13th are recorded on the accompanying chart.

Thus all the urines contained bile. Albuminuria and cylindruria occurred. The diazo reaction was not obtained in any specimen. Tyrosin was demonstrated in the urine of two cases of the six, W——h and L., and was not present in the others on December 13.

Specimens of stools were taken from each patient for bacteriological study. They all were semi-solid, fonl-smelling, brownish and bile-containing, except that of L., which was creamy white, extremely fetid, and acholic.

The clinical picture, as a whole, then, consisted of an acute infectious disease characterized by a sudden onset, leucocytosis, gastro-intestinal disturbances, jaundice, muscle pains, enlarged spleen, and nephritis, agreeing well with Weil's (*l. c.*) four cases.

Result: In four cases *B. coli* was isolated; in the other two an unidentified spore bearer. Both organisms were considered contaminations on account of the conditions under which the specimens were obtained.

3. *Stool Cultures.*—Specimens of stool were taken from bed pans in each case and carried away in sterile bottles. Plating with simple agar-agar was resorted to at once, in the absence of special media. The specimens were preserved on ice, and later cultures were also made upon picric-acid-brilliant-green agar plates, prepared after the method described by Conradi [Conradi (H.), Münchener Med. Wchnschr., 1908, LV, 1523: Ein Verfahren zum Nachweis spärlicher Typhusbazillen].

Result: (a) Agar-agar plates: no satisfactory information —*B. coli* and ordinary intestinal flora.

(b) Picric-acid-brilliant-green plates: a growth obtained in 20 hours from the stools of W., L., and K.

CHART.

Name.	Characteristics.	Spec. Grav.	Reaction.	Sugar.	Alb.	Sed.	Microscopic Examination.	Remarks.
W——. 18th day..	Highly colored orange.	1014	Alk.	0	Faint trace.	Flocculent.	Debris; triple phosphate crystals.	Gmelin +. Diazo 0.
W——h. 15th day..	Deep amber color.	1022	Alk.	0	Faint trace.	Flocculent.	A few granular casts, squamous epithelium, ammonium u rate and triple phosphate crystals.	Gmelin ++. Diazo 0.
L——. 11th day..	Highly colored orange.	1012	Ac.	0	Heavy greenish cloud.	Flocculent.	Many white blood corpuscles, casts, coarsely granular, with cells attached; bile stained, motile bacilli.	Gmelin ++. Diazo 0.
K——. 11th day..	Deep greenish brown.	1022	Ac.	0	Heavy cloud.	Granular and pink.	Waxy and hyaline casts, bile stained; a few white blood corpuscles.	Gmelin ++. Diazo 0.
D——. 8th day..	Deep orange.	1022	Ac.	0	Faint trace.	Flocculent.	Debris; ammonium urate and triple phosphate crystals.	Gmelin ++. Diazo 0.
J——. 5th day..	Deep orange.	1013	Alk.	0	Faint trace.	Flocculent.	Bile stained debris.	Gmelin ++. Diazo 0.

III. The Bacteriological Study.

The bacteriological examinations made included (1) cultures from the blood, urine, and stools, (2) animal inoculations with the blood of the patients, and (3) the examination of the blood serum for specific agglutinins.

1. *Blood Culture.*—Fifteen cubic centimeters of blood were taken aseptically from the median-basilic vein of each patient and distributed among the following media: (1) Broth flask (50 cc.), 1; (2) milk flask (50 cc.), 1; (3) tubes of ox bile (10 cc. each), 3; (4) blood-agar plates, 3.

Result: In no one of the six cases was there any growth in any of the media.

2. *Urine Cultures.*—The urine was not obtained by catherization, but was passed into sterile flasks after washing of the glans penis. Irrigation of the anterior urethra was not practicable. The specimens were then centrifugalized and cultures made from the centrifugalized sediment upon the following: (1) Blood agar, 1; (2) glycerine agar, 2; (3) ox bile, 2; (4) milk, 1; (5) broth, 1; (6) agar plates, 5.

Small, round, discrete, opalescent, greenish colonies with thicker center than periphery, appearing within the time allotted by Conradi to *B. typhosus* and *B. paratyphosus,* but resembling in cultural characteristics *B. coli.*

4. *Animal Inoculation of Patient's Blood.*—Six cubic centimeters of defibrinated blood from patient No. 4, K., were injected into the ear vein of a black and white rabbit of 1820 gm. weight.

Result: The animal died three days later, appearing quite normal until the last 12 hours, when it seemed intoxicated and stupid. It died in coma apparently, without convulsions. It showed no loss of weight and no jaundice. The autopsy revealed nothing remarkable. There were no lesions in the liver, and there was no gastro-enteritis. Cultures from the heart's blood upon blood agar, bile, broth, and milk were sterile.

5. *Examination of the Blood Serum for Specific Agglutinins.*—The following agglutination tests were made with the serum of each patient: (1) With *B. typhosus* in dilutions of

serum of 1-10, 1-50, and 1-100; (2) with *B. paratyphosus,* strain "Cushing," isolated in 1899; strain "Kurth," in 1901; and strain "Sladen," in 1908, in dilutions of serum of 1-10, 1-50, and 1-100.

Result: (a) For *B. typhosus:* no agglutination after one hour in greater dilutions than 1-10 of the serum. Negative for specific agglutinins.

(b) For *B. paratyphosus:* (1) Strain "Kurth," no agglutination in any dilution of serum; (2) strain "Sladen," no agglutination; (3) strain "Cushing," the sera of K., No. 4, and J., No. 6, gave the following results: 1-10, excellent clumping, no motility; 1-50, excellent clumping, no motility; 1-100, fair clumping, slight motility. And the sera of W., No. 1; W——h, No. 2; L., No. 3; and D., No. 5, agglutinated as follows: 1-10, excellent clumping, no motility; 1-50, excellent clumping, an occasional motile bacillus; 1-100, good clumping, slight motility.

These agglutination tests were repeated two days later with similar results.

In a word, positive agglutination reactions were obtained for *B. paratyphosus,* strain "Cushing," with the serum of every case.

It is only fair to add that the serum of each case except that of W., No. 1, contained visible bile pigments, described at the time in this way:

Serum of W., No. 1, no jaundice; serum of W——h, No. 2, very slight jaundice; serum of L., No. 3, heavy jaundice; serum of K., No. 4, fair jaundice; serum of D., No. 5, slight jaundice; serum of J., No. 6, slight jaundice.

Many authors, notably Eckhardt (24), depreciate the value of serum reactions in this disease on account of the presence of bile in the serum, to which they attribute the agglutinating power of the serum for the typhoid and paratyphoid bacilli. However, Conradi, in the article quoted above, has only recently emphasized the fact that bile does not agglutinate those two organisms, and he makes use of this knowledge in differentiating them from the positively agglutinated colon bacillus in the plating of stool cultures. It is noteworthy that the strongest agglutinating reactions were obtained with the sera of two patients who were less jaundiced than the others.

Experience has shown that the *B. paratyphosus* (strain "Cushing") is very easily agglutinable, and, since other strains were not agglutinated, one might think it unwise to lay much stress upon this positive finding. Very careful controls, however, made with salt solutions, indicate that specific agglutinins were present in the sera of the patients.

IV. Epidemiology.

Though a very small one, we had to deal here indisputably with an *epidemic* of gastro-enteritis with jaundice. It seems remarkable that but six out of the 700 men in the jail were affected. And yet Hennig (*l. c.*) has pointed out that in army experiences the recently enlisted soldiers are more susceptible than the well-seasoned ones. Something renders some men more liable to attack than others, even when all are exposed to the infection. The men, in this instance, were quartered within the same walls, but their cells were well separated, thus: L., No. 3, 2d tier, section 2; K., No. 4, 3d tier, section 2; W., No. 1, 4th tier, section 2; W——h, No. 2, 1st tier, section 2; D., No. 5, 6th tier, section 2; J., No. 6, ———, section 3.

The first five men ate in the same dining room, but not at the same table. On December 1, L., No. 3, sat behind W., No. 1, in the dining room. The latter had been sick for five days at this time, and was sent to the jail hospital the next day, December 2. L. was taken ill on December 3, and sent to the hospital December 5. The other cases developed in rapid succession:

	Onset.	Sent to hospital.
1. W.,	November 26	December 2
2. W—h,	December 1	" 14
3. L.,	" 3	" 5
4. K.,	" 3	" 7
5. D.,	" 5	" 12
6. J.,	" 9	" 10

These cases all developed within fourteen days, four of them within five days. Pletzer (25) and Lürman (*l. c.*), in an epidemic of 200 workmen in Bremen, found the limits of incubation to be from a few days to several months.

Writers on the subject remark that they have never observed transmission by contagion, and it seems possible to rule it out in our cases. As noted, their cells were on different tiers and in separate sections. In the dining room they were never at the same table. The men used different lavatories. W., K., L., and W——h, worked in the brush shop, but never near one another. D. worked in the wicker shop, and J. on section 3.

Every man in the jail drinks city water from the hydrants. That and food are the only articles in common, and one of these must be regarded as the probable source of this epidemic. Three of the men, who are serving long terms, receive meat once a day, the other three four times a week. Otherwise the diet consists of soup and bread. No particular article of food could be found accountable for the upset. The meat perhaps is the most open to suspicion, and in other similar epidemics contaminated meat has frequently been held responsible. Many meat poisonings appear to be gastro-enteritis due to the *B. paratyphosus* or its toxines. It is surprising how often meat and sausage harbor the *B. paratyphosus.* The studies of Dahm (26) are especially instructive in this respect.

V. Conclusions.

On analysis, several features of this little epidemic are worthy of emphasis.

In the first place, the *infectious character of the disease* is clear. The sudden onset with chill, fever, headache, general muscular pains, and leucocytosis are evidence of infection and intoxication. The negative results of blood cultures point to some local infection rather than to a bacteriæmia.

Secondly, the gastro-intestinal features, nausea, vomiting, diarrhœa, and colicky abdominal pain make the diagnosis of *gastro-enteritis* necessary, and this is in accord with the opinion advanced above, namely, that food, and probably meat, was the most likely source of the infectious agent.

Thirdly, in every case the jaundice was obstructive in type, lasted from only two to three weeks, and exhibited the characteristics of a *catarrhal jaundice* associated with the gastro-enteritis. A bacterial invasion of the bile passages and even the liver is possible, as Hoppe-Seyler and Quincke (*l. c.*) suggest. The finding of tyrosin in the urine of two cases is in favor of this. The jaundice has been emphasized by Weil (*l. c.*) and others as the main feature of the disease. But that epidemic gastro-enteritis without icterus can occur seems very probable, as in the "swamp fever" epidemic reported by Müller (27). A disproportionate attention to the jaundice in such cases has led to the error of regarding the so-called Weil's disease as a separate clinical entity. The fact that it requires from two to eight days for the jaundice to appear points to an extension of the inflammation of underlying gastro-enteritis to the papilla of Vater and the bile passages resulting in obstruction.

Fourthly, we have formed some ideas as to the *etiology*. Either water or food (the only things in common in these cases) must have been the source of the infection. Drinking water and water used for bathing have been emphasized in the German epidemics among soldiers by Frölich (*l. c.*) and others. In fact, Jäger (*l. c.*) succeeded in isolating his specific proteus from the waters of the Danube at a bathing pool, as well as from the urine of the living patients and the organs of the dead. But more emphasis, and especially recently, has been laid upon tainted meat. Schmidt, Leick (28), Fiedler (29), and others emphasize it in connection with infectious jaundice. Moreover, the whole history of the intermediate group of intestinal bacteria from Gaertner's first isolation of *B. enteritidis* in 1888 to date is connected with the ingestion of tainted meat, and resultant gastro-enteritis of varying severity.

The only positive results of the bacteriological study in our cases suggest the *B. paratyphosus* as the invading micro-organism. Two possibilities present themselves. Either we may assume that the bacillus already present in the intestinal tract of several prisoners[1] rapidly multiplied during a period of lowered resistance from unknown cause, or we can think of the bacillus as having been introduced through the food. Though we suspect the bacillus paratyphosus in our cases, a study of the bibliography makes it seem probable that several different organisms are capable of causing such a gastro-enteritis with associated catarrhal jaundice as that we report; the severity of the symptoms in the various cases indicates the severity of the individual infections.

The sequence of events in our cases, it seems to us probable, was as follows: 1, ingestion of tainted meat, containing living paratyphoid bacilli; 2, development of a gastro-enteritis due to this micro-organism; and 3, the appearance of a catarrhal jaundice due to extension of the gastro-enteritis to the biliary passages.

[1] According to Rimpau normal human fæces contain the *B. paratyphosus* in 6 per cent of the cases examined.

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PRIMARY MELANOTIC SARCOMA OF THE OVARY.

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There is as a rule little difficulty in determining the point of origin of pigmented neoplasms. The great majority can be traced to congenital pigmented moles of the skin; some arise from the pigmented cells of the choroid of the eye and other parts of the central nervous system where pigment producing cells normally occur, as for instance the choroid plexus; a few have been observed to arise from the region of the matrix of the nail, and others from muco-cutaneous junctions or mucous surfaces where no primary mole was to be made out.

Even in some cases where a melanotic sarcoma seemed to

arise in an obscure position, its origin could be traced to misplaced tissue. Aman, for instance, reports a case where a lobulated black tumor of the ovary, the size of a child's head had developed in a small dermoid cyst of that organ. One year and a half after extirpation of the primary growth the patient came to autopsy with multiple metastases chiefly in the bone marrow and the liver.

Recently Gibbon and Despard have reported a typical melanotic sarcoma arising in the rectal mucosa. In their article they note that from 15 to 20 cases of primary melanotic sarcoma of the rectum are reported, and they consider the large number of pigmented tumors arising in the rectum the more remarkable since the rectum is practically the only portion of the alimentary tract where these pigmented tumors occur. They mention the unique case of Sir Frederick Treves where the ileum was the seat of the primary growth.

The explanation of pigmented tumors arising in areas where normally pigment producing cells do not exist, is still obscure. Duval suggests the possibility that pigmented cells of the choroid or other pigmented areas may be dislodged and acquire tumor characteristics in obscure areas. He reports a unique case of a pigmented tumor arising in and completely obstructing the common bile duct. The tumor was epithelial in structure and apparently was primary in the epithelial lining cells of the common bile duct, although the author also considers that the tumor may have had its origin in dislodged pigmented cells from some normally pigmented area.

Duval thinks the entire question concerning the origin of melanotic tumors in mucous surfaces and internal organs is dependent upon whether cells can produce pigment under suitable conditions no matter what their primary origin may be. He quotes Hertwig, Rössle, and Meirowitz-Grandenz, who think the pigment of melanotic tumors is formed from particles of chromatin extruded by the nucleus. Rössle even thinks that pigment found in senile conditions such as brown atrophy of the heart is produced in the same way, and is identical as far as micro-chemical tests go to the pigment of melano-sarcomata.

Bab discusses the nature of this pigment at length. He likens its formation to that of fibrous tissue, and calcium deposits in pathological conditions and suggests that the pigment may be formed as a protective substance; but just as fibrous tissue and calcium might in turn be harmful, so Bab thinks the formation of pigment might be considered, inasmuch as it may be the origin of a melano-sarcoma. Bab has collected the cases where the female genital tract was the primary seat of a melanotic sarcoma. It is interesting to note that while there are in all 35 cases in his report by far the greater number occur on the labia, clitoris, and vulva, while the mucous surfaces are only rarely affected. In none of these latter cases, however, could it be said with certainty that the tumor arose in the mucosa.

The ovary was the seat of origin of the tumor in three cases, but on further analysis, it will be seen that the evidence in support of this organ as the primary seat of the tumor is conclusive in only one case. This is the case of H. Russel Andrews. The woman, aged 35, was married and had six children; the youngest seventeen months old. She entered the London Hospital complaining of loss of weight and strength. Examination revealed a hard nodular sensitive tumor of the ovary. At operation this was confirmed. The tumor was not adherent to any of the surrounding viscera. It measured 7 x 4 inches, was deeply lobulated, and very firm. On section the tumor was likewise deeply pigmented. Microscopically the tumor had an alveolar arrangement, and the cells were mostly of the large round cell type. In many of the alveoli there was a myxomatous degeneration. Large masses of pigment occurred in abundance, especially along the fibrous septa of the tumor. The pigment occurred both free and within the cells of the tumor. Micro-chemical tests failed to show the presence of iron. At operation a few small metastases were found in the omentum, and on the anterior peritoneal surface of the uterus. The patient recovered completely from the effects of the operation, but unfortunately no subsequent history could be obtained.

The second case is the one above cited and reported by Aman. In this instance the melanotic tumor developed in a dermoid of the ovary.

Westenhöeffer and v. Leyden report a case where there was a circumscribed black nodule, the size of a plum in either ovary. "These tumors were large," Bab says, "in comparison to the hundreds of smaller tumor nodules scattered throughout the body, but despite this it seemed to him that in such an outspoken sarcomatosis it was impossible even by exclusion to imagine the ovaries as the primary seat of the tumor."

Bab adds one more case, but here again the author does not consider the origin of the neoplasm absolutely determinable. This case is rather interesting inasmuch as it was reported previously by Mangelsdorf in his inaugural thesis. Mangelsdorf considered the tumor as arising in the skin of the leg and the sarcoma found in the wall of the ovarian cysts as pigmented metastases. The woman was 39 years old, had had one child two years previously and an abortion during the past year. During her second pregnancy she had had abdominal pain, vomiting, etc., which did not complicate the first pregnancy. Three weeks after the abortion, the patient noticed four nodules on the right thigh which grew rapidly and were followed by many similar ones. The patient gradually weakened, and her disease ended fatally, less than three months after the first tumors of the skin were observed. At autopsy there were numerous nodes on the right leg from a pea to a walnut in size. These varied in color from red to gray or black and many of them showed ulcerated surfaces. The abdomen was distended and contained an excess of dark brown, turbid fluid. Both ovaries were converted into large multilocular, cystic tumors which were held to the bowel by light adhesions. The walls of the cysts measured from a few millimeters to 3½ cm., and in the thicker areas showed on section numerous black nodules. Microscopically, sections through these areas showed them to be large round celled sarcomata of an alveolar type with many

hæmorrhages through them, but in other areas there were dense masses of pigment of an entirely different nature, which resembled in every respect the pigment usually found in skin melanomata. In reviewing this case we must agree with Bab, that there is considerable doubt as to whether this is really a primary tumor of the ovary. He, however, leans strongly to the possibility.

Recently the following case which seems undoubtedly to be a primary melanotic sarcoma of the ovary came to antopsy at the Johns Hopkins Hospital. On account of the unique history this will be briefly summarized.

M. T., white, female, age 26 years.

The patient was admitted under Dr Harvey Cushing's care to the wards of the Johns Hopkins Hospital on October 9, 1907. Her family and past history are of little importance in connection with her present illness. This dates from April, 1907, when she began to suffer with severe headaches, which have been accompanied from the outset by attacks of nausea and vomiting. About the first of June the patient's sight became dim. This was followed by diplopia. During the course of her illness she had become weak and her memory had failed slightly. On admission physical examination of the chest and abdomen were negative. The pupillary reactions were normal. There was a slight nystagmus on extreme lateral diversion. There was no exophthalmos. The face showed no asymmetry except possibly a slight drop at the right corner of the mouth. The deep reflexes were normal. Retinal examination showed a choked disc measuring 8-9 diopters. The retinal vessels were much engorged: there were exudates, and a few small retinal hæmorrhages. In October a subtemporal decompressive craniotomy was performed. During the operation a lumbar puncture was done and a large amount of fluid removed under high tension, allowing the brain to subside to a considerable degree. The decompression was followed by the usual beneficial effects though there was an occasional headache and the choked discs did not completely subside. The patient left for her home but returned to the hospital late in January, 1908. Her condition remained unchanged during this interval. By the following month certain symptoms had appeared which led to the suspicion that the tumor lay in the cerebellum, and on February 10 a suboccipital exploration was made with negative findings. The patient recovered rapidly from the operation, but her condition remained the same as before. Subsequently there occurred a definite weakness on the left side, together with astereognosis and other sensory disturbances of the left hand. These symptoms served to localize the tumor, and on the 14th of April a final operation was performed by Dr. Cushing.

The dura was opened and disclosed a tense, dry and very vascular cortex with flattened convolutions. The brain bulged tremenduously from the wound, despite the fact that the spinal fluid was draining through a lumbar puncture. In the anterior portion of the parietal lobe, palpation revealed an area more resistant than the remainder of the exposed hemisphere. Incision through the cortex disclosed a firm encapsulated growth which by simple blunt dissection was lifted away from the brain apparently intact. The patient's condition at the end of the operation was good.

The tumor was definitely encapsulated, weighed slightly less than 100 gm., and measured 7 x 5 cm. It was exceedingly dark in color, and on section presented a homogeneous surface of almost coal-like blackness, evidently a melanotic tumor.

Following operation there was a transient left-sided paralysis. This gradually subsided and the patient improved to such an extent that there were hopes of complete recovery. However, considerable protrusion occurred at the seat of operation in the course of a few weeks—due, as was supposed, to the formation of arachnoid cysts, and on repeated occasions fluid was withdrawn by tapping the protrusion. In the course of time these failed to diminish the degree of tension: the left-sided hemiparesis gradually returned with evidences of pyramidal-tract involvement—shown by the characteristic change in the reflexes. On the 28th of August there were evidences of pulmonary involvement, and numerous râles, both coarse and fine, were heard over the chest. Her condition gradually became worse and she died on September 2, 1908. Subsequent to the operation careful examination of the skin for a possible primary source of melanoma proved negative. No vaginal examination was made, as there were no symptoms referable to the pelvic organs.

Autopsy No. 3194.

Anatomical Diagnosis.—Melanotic sarcoma of right ovary with metastases to the brain, anterior mediastinal lymph glands, and left ovary. Operation: Removal of a portion of the tumor from the brain; chronic fibrous pulmonary tuberculosis with cavity formation; pulmonary emphysema; fatty degeneration of the liver; chronic diffuse nephritis; anæmia.

Body.—Is that of a somewhat emaciated white woman, 162 cm. in length. In the anterior portion of the right temporal region there is an area which protrudes from the surrounding surface. This is bound above by a healed surgical incision. The neck has been opened and the common carotid arteries have been injected with formalin. As a consequence there is a considerable bulging of the entire right side of the head, extending below to the zygomatic process, as far back as the occipitoparietal suture, and to the median line at the upper portion of the head. The pupils are unequal, the left measures 3 mm., the right 7 mm. in diameter. The abdomen is scaphoid. The skin over the entire body is remarkably white and colorless. Despite careful search, no pigmented moles are to be seen anywhere on the body. The abdominal fat is scanty in amount.

The abdominal cavity contains no excess of fluid. There is a tumor occupying the pelvic inlet, which is lobulated and of a purplish black color. This completely fills the area between the promontory of the sacrum and the symphysis, and extends as far as the ileo-pectineal line on the left. On the right side the mass projects somewhat farther and is connected by rather œdematous, fibrous adhesions to the appendix. A large vein runs to the mass from the sigmoid flexure of the colon. The tumor is freely movable, and on delivering it into the abdominal cavity it is found to be adherent laterally to the fascia and peritoneum, on the right side, and in intimate connection with the large vessels in the neighborhood. The ovarian artery and vein are very much enlarged, and run directly to this mass. The uterus is found deflected considerably to the left but connects with the mass by the broad ligament. The right tube lies on the inferior and posterior aspect of this tumor. The right ovary is not present as such, but its position seems to be occupied by the above described growth. The left tube and ovary seem normal in size and position. The ovary is possibly slightly enlarged, and its surface is marked by a small irregular black area. The round ligament on the right side is congested and of a purple color. The urinary bladder is somewhat dilated, but there are no adhesions between it and the tumor. The latter has an elastic consistence. The capsule over its outer surface is of unequal thickness and presents a mottled appearance, deep purplish-black areas of tumor pulp intervene between silvery-gray areas of thickened capsule. On palpation the tumor is quite firm and elastic for the most part, while in a few small areas it gives the impression of being semi-fluid in character. On the lower surface there is a small area where the capsule has been torn away from its attachment to the broad ligament, and

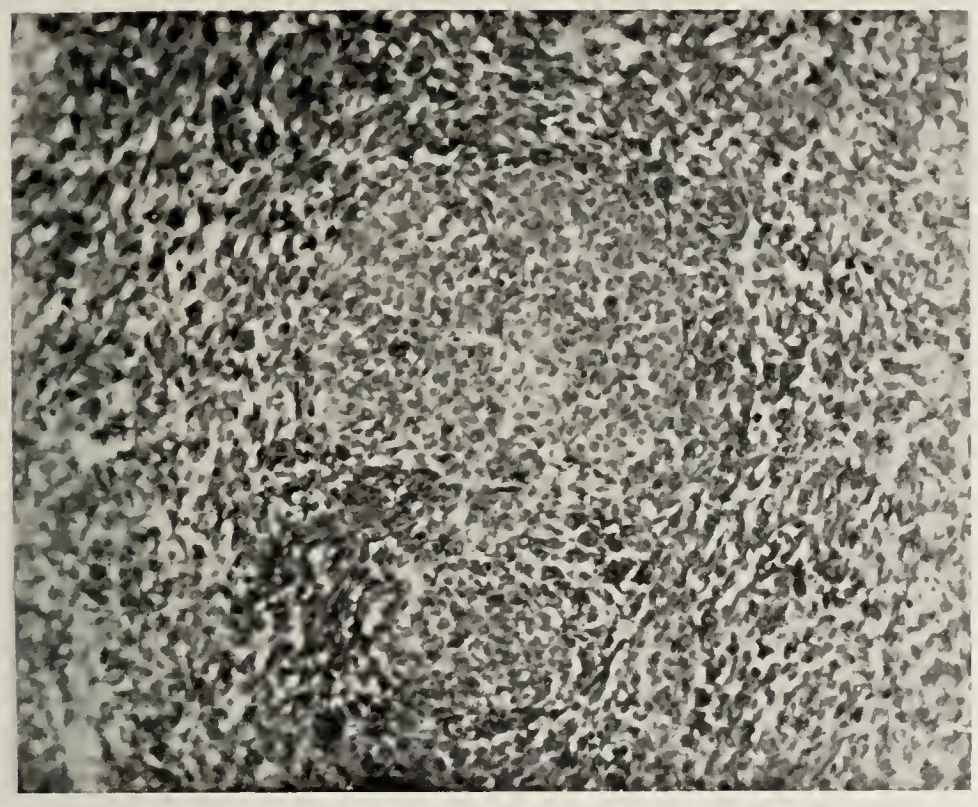


FIG. 1.—Non-pigmented nodule of tumor cells in the secondary growth.

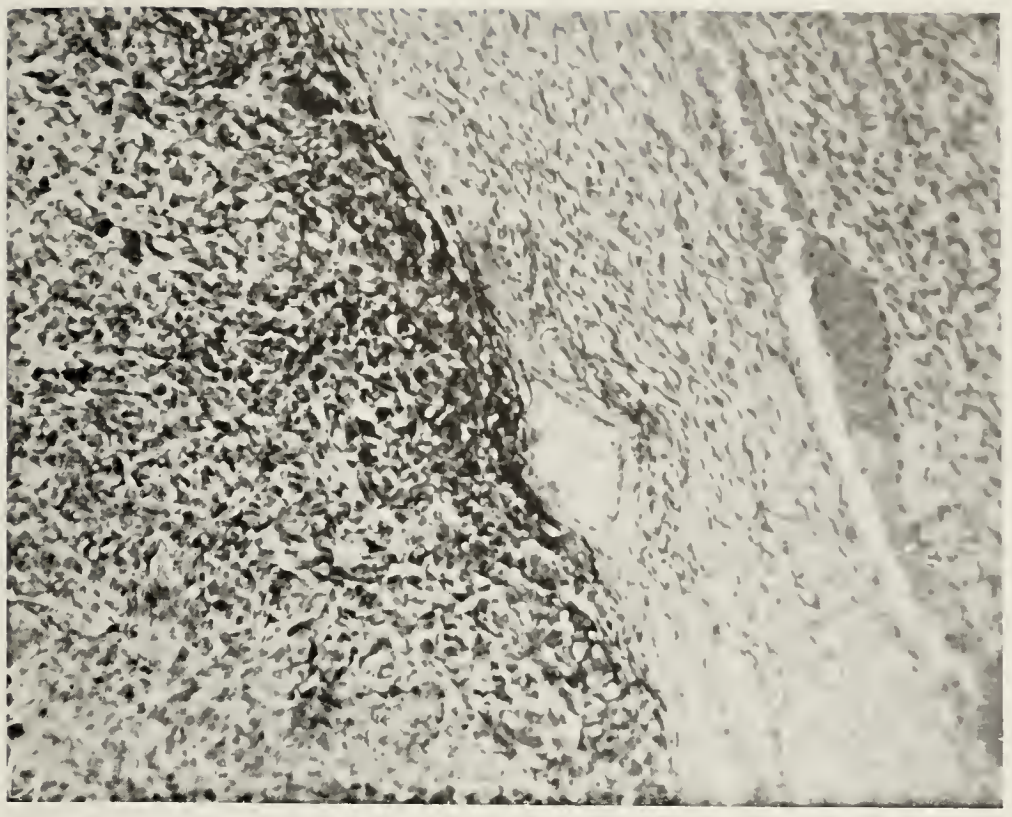


FIG. 3.—Showing the border of the metastatic tumor of the right ovary.

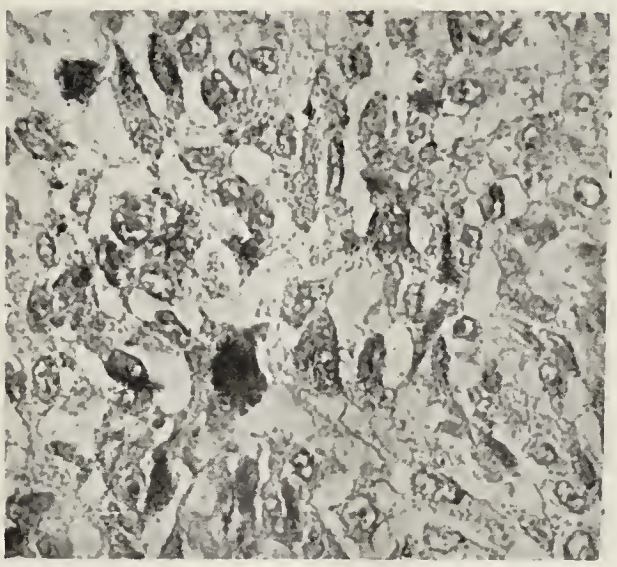


FIG. 5.—Greater magnification of Fig. 4.

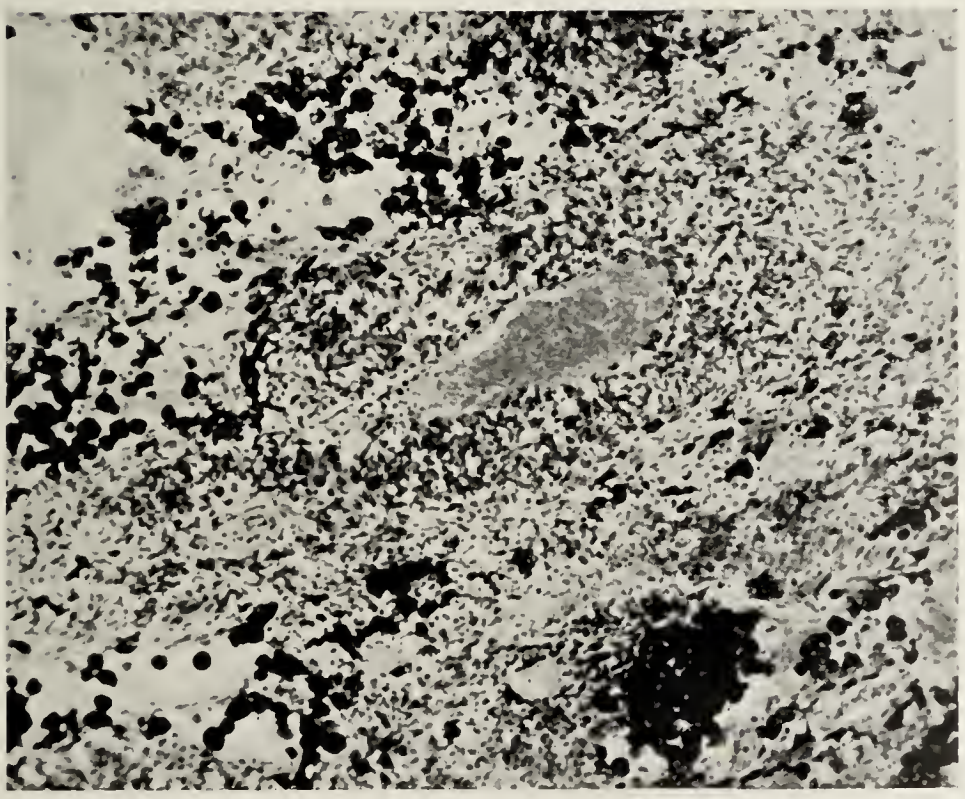


FIG. 2.—Showing perithelial arrangement of the growth; with external areas of necrosis in which masses of pigment occur.

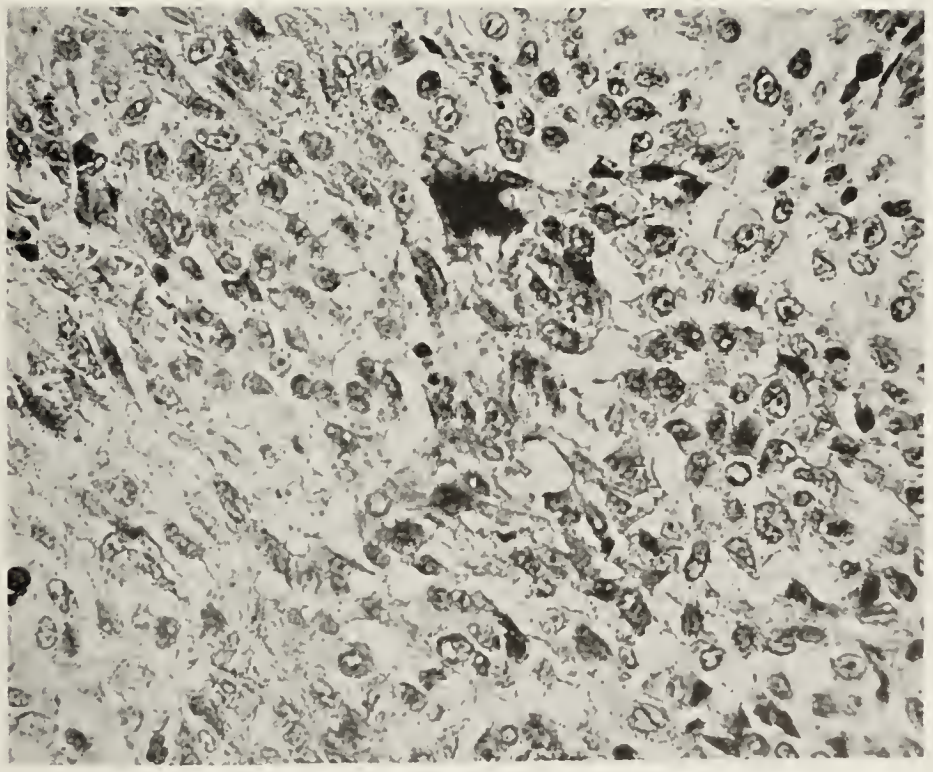


FIG. 4.—Showing the character of the tumor cells.

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FIG. 6.—Primary tumor of right ovary and small metastatic nodule in left ovary.



FIG. 7.—Metastatic nodules in brain.

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here a grayish-purple, mottled-tumor pulp can be made out. The abdominal contents otherwise seem normally disposed. On cutting the left ovary a circumscribed nodule 1½ cm. in diameter is found. This lies just beneath the irregular, dark area described on the surface. This nodule is definitely circumscribed, and of a homogeneous black color. It resembles the tumor found in the brain in every detail (see below). The tumor that has involved the right ovary presents, on section, a very striking appearance. It is coarsely lobulated; the lobules being formed by indentations of the thickened, grayish capsule above described. Many of these lobules have a papillomatous appearance, their free ends being wider than their base. The lobules are divided into smaller spaces, which, however, are indefinite compared to the above-described larger divisions. The tumor varies greatly in color. It is definitely pigmented, but is not nearly as homogeneously black as the metastatic tumor in the brain and left ovary. It is mottled, irregular, linear, black areas alternating with those which have a paler grayish color. Other areas are scattered about which are pale gray and more opaque than the remainder of the tumor, and which are not pigmented. In many areas one sees depressed, reddish-brown patches which are evidently areas of hæmorrhage. The tumor tissue lying just beneath the capsule in several of the large lobules is quite black, but this zone only measures a few millimeters in thickness, and the tissue lying within the lobule is mottled with paler grayish-black areas.

I am indebted to Dr. Cushing for the following note on the head and brain:

"*Head.*—There is a large bone defect the size of the palm of the hand over the right hemisphere, the seat of previous operations. Through this protrudes a cerebral hernia, protected by intact scalp.

"The brain was hardened in situ by carotid injections. A bulging area of the cortex, which corresponds with the bone defect, shows on its posterior surface a small black area 2 or 3 cm. in diameter, evidently the seat of a growth recurrent at the situation from which a tumor has been removed at operation. Elsewhere over the surface of the brain are black foci, showing sites of other metastases. One of these, measuring 3 cm. in diameter, is situated just above the posterior end of the Sylvian fissure in the left inferior parietal lobule. Another small superficial nodule is present on the right side of the brain, in the occipital lobe. The convolutions are much flattened, and those over the area which had protruded are thin and collapsed and cover what is evidently the remains of a collapsed subcortical cyst.

"A coronal median section passing through the third ventricle and interpeduncular space discloses an enormous, coal-black growth, measuring 8 cm. in its transverse and 10 cm. in its vertical diameter. This black growth has an external shell of tumor varying from ½ to 2 cm. in thickness, and a central content of blood clot. In one place the blood clot has come within 2 or 3 mm. of the external surface of the tumor, but nowhere has it apparently burst through the tumor. The growth itself is sharply outlined and can be easily separated from the brain. In the opposite hemisphere a single nodule, 3 or 4 cm. in diameter, is disclosed on this section. This metastasis lies 2 cm. below the surface of the hemisphere and just above the Sylvian fissure at its greatest depth.

"There is no evidence of the suspected arachnoidal cysts developing in consequence of the scalp-covered brain. In the upper portion of the herniated part of the cortex is a cavity measuring 2 or 3 cm. in diameter, which appears to be the original cavity from which the tumor was removed. Posterior to this is a cyst containing a delicate membranous lining and a somewhat honeycombed wall, which does not seem to have any connection with the tumors.

"None of these tumors exposed seem to be undergoing cystic degeneration, as was the case with that originally removed at operation. All of the metastases disclosed, except the enormous growth described above, lie in fairly "mute" regions of the brain. The large metastasis must necessarily have cut off the entire pyramidal tract and have been responsible for the patient's hemiplegia which slowly developed after the last operation. The brain itself is greatly dislocated by this large growth, and the right ventricle is dragged up externally to what would originally have been the level of the skull on this side. Although there is no apparent communication it is quite possible that it might have been in direct connection with one of the superficial cysts."

Microscopical Notes.

Tumor.—Sections from the tumor of the right ovary show it to be surrounded by a thick, fibrous capsule which projects down in areas between the cellular tumor mass. In the well-preserved portions of the mass one sees that it is made up of very cellular tissue, which is well preserved for the most part, but which shows several large areas where there is no longer any structure to be made out, except for scattered masses of deeply pigmented cells. By far the greater portion of the cells composing this tumor are irregular, spindle-shaped cells which have processes communicating with neighboring cells of the same structure. They are quite irregular. Their protoplasm stains pale pink and is finely granular. These granules, however, are inconspicuous and stand out as rather clear, vacuolar spaces. The nuclei of these cells are very large and vesicular. They show numerous stages of mitosis, and one can make out many different forms of atypical division. Scattered between these cells in various areas one finds cells which are very much obscured on account of dense masses of golden-brown pigment which are found in their protoplasm—in many places entirely obscuring the nuclei. Where these nuclei are to be made out they have much the same appearance as those described in the larger spindle-shaped cells. The granules of pigment are very irregular in size. Some of them are quite small, others are large, irregular and opaque. One finds on searching carefully through the long spindle-shaped cells which were first described that many of these have a few granules of pigment within their cell-protoplasm. The areas of degeneration above described show a diffuse eosin staining network in which large numbers of round-pigmented cells are found, and in which large granules of pigment, not contained within cells, also occur. In another area of the primary tumor one sees a definite perithelial arrangement of the growth, and here the necrosis is rather extensive, only a few layers of cells lying immediately around the blood vessels being well nourished, and the remainder fading off into an eosin staining, necrotic tissue in which large amounts of pigment are found. The metastatic tumor in the ovary is very well preserved and is definitely circumscribed by a fibrous capsule; the ovarian tissue in its vicinity is compressed. The cells composing this tumor resemble those of the primary growth very closely, but the pigment cells occur in greater abundance. Here and there a circumscribed area of the tumor occurs in which no pigment is to be found. Sections from the tumor in the brain have practically the same characteristics as those above described, except that the necrosis in many areas is more extensive, and seems to have been brought about acutely, for one sees broken-down nuclei here in abundance. The tumor removed at operation is practically identical in its microscopic picture with the ones obtained at autopsy.

There is a striking resemblance between the case reported by Dr. R. Andrews and this one. It will be remembered that there were no symptoms referable to the ovarian growth in either case. In the first the patient complained of loss of

weight, and strength, and the only symptom which could be referred to the tumor was a slight dyspareunia. In our case all of the symptoms indicated a morbid intercranial condition. In both instances the tumors were freely movable and only bound to the surrounding structures by a few adhesions. Both were coarsely lobulated, and deeply pigmented. Microscopically the one was composed of large round cells, in an alveolar arrangement; the second of large spindle cells in a perithelial arrangement. Both types of cells contained fine and coarse granules of pigment, and this pigment was found extracellularly more abundantly in the degenerated area.

In our case a careful search was made throughout the body for some conventional area of origin. There were no moles in the skin. Examination of the eye grounds during life failed to reveal any abnormal growth of the cells of the choroid; and at autopsy the fundi of the eyes were removed and carefully examined with entirely negative results. Following the suggestion of Dr. Welch the choroid plexuses were carefully examined in the hope that the pigmented cells occasionally found in that area might be responsible for the tumor, but here again the findings were negative. The possibility that the tumor might have originated in a dermoid was not overlooked, but nothing of such a nature could be made out. If we review the character of the various growths found in this case it will at once become apparent that the small, homogeneously pigmented nodule of the left ovary corresponds in every detail to the nodules in the brain. They are all enclosed in a definite capsule. The tissue about them is compressed and the tumors themselves present a monotony of color. The tumor in the region of the right ovary, however, is lobulated, apparently growing in an invasive manner and presents much greater diversity of appearance both in the gross, and the microscopic picture. It seems therefore without doubt that we are dealing here with a primary melanotic sarcoma of the right ovary. This is one of the rare instances where a pigmented tumor has arisen from a normally non-pigmented area, and is the fourth case of this nature. The others are (1) Treve's tumor of the ileum, (2) Duval's tumor of the common bile duct, (3) Andrews' tumor of the ovary.

In conclusion I wish to thank Dr. Cushing for kindly allowing me the use of the clinical history, and the note on the brain, and Mr. Max Broedel and his pupil, Miss v. Stocsser for the drawings of the ovarian tumor and the brain.

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SOME RESULTS OF THE INJECTION OF BECK'S BISMUTH PASTE IN THE TREATMENT OF TUBERCULOUS SINUSES.*

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Associate in Orthopedic Surgery, The Johns Hopkins University.

Sufficient time has now elapsed to arrive at some conclusions regarding the diagnostic value, the therapeutic efficacy, and the inherent dangers in the treatment of sinuses and fistulous openings with Beck's Bismuth Paste.

The extreme simplicity of the method and the excellent results obtained by Beck aroused the attention and compelled their verification by surgeons throughout the world.

If by injecting the various varieties of the bismuth pastes these cases of chronic suppuration and continuously discharging sinuses can be cured, medicine has marked another epoch in her history.

What then have been the results at the hands of the profession? Have they been successful and if so to what degree? Is the procedure harmless or are there any dangers associated with the method? These are some of the questions which demand an answer.

Before collecting the opinions of the many physicians, who have employed the method, allow me to report a small series of cases which have come under my own observation, for they contain some of the points which we wish to bring out.

* Read before The National Congress of Tuberculosis, May, 1909, Washington, D. C.

Case 1.—C., age 24 years, has a large, discharging non-tuberculous osteomyelitis of the head and neck of the right femur. The duration of the disease has extended over a period of two years, and the sinus has been discharging for 18 months. Three operations have been performed during that time, but the sinus still persists, the discharge amounting to at least 2 ounces daily.

October 31, 1908. Three ounces of Beck's Bismuth Paste (Formula No. 1) was injected; in four days the sinus was entirely healed and has remained so, the last examination having been made May 1, six months after the injection. There was no general reaction of any kind following the injection.

Here, then, is a case of osteomyelitis of the upper end of the femur with complete cure after one injection.

Case 2.—W., age 14 years. Two years ago the boy jumped on a stone and bruised his left ankle. Four days later his temperature reached 104° F., and an abscess formed and discharged opposite the ankle joint. This has been discharging ever since. Six weeks after the original injury an abscess broke open over the first metatarsal bone on the right foot.

The sinus over the left ankle was first injected October 30, 1908. The sinus over the right foot was not injected but treated in the usual manner for comparison. Ten injections were given at intervals of about three days, at the end of which time (six weeks) the sinus was entirely healed. It has remained so, five months later. There has been no improvement in the sinus of the right foot, which was not so treated.

Summary.—Osteomyelitis of the left fibula healed in six weeks with ten injections. Fig. 1 shows radiograph with bismuth paste in fibula three weeks after the last injection.

Case 3.—B., age seven years; duration of the disease six months following a fall. Decided kyphosis of the eighth dorsal vertebra. There is a tuberculous sinus opposite the left trochanter, which has been present four months. The X-ray picture (Fig. 2) shows a tuberculous erosion of the descending ramus of the right pubic bone. This was operated upon and the diseased area removed, and the wound closed, which healed *per primam*. The first injection with bismuth was made on December 20, 1908. Twenty-one injections were made at intervals of three days, covering a period of three months. The sinus is entirely healed and has remained so for the past seven weeks.

Summary.—Pott's disease; sinus on thigh closed after twenty-one injections, covering a period of three months.

Case 4.—H., age four years. Patient has tuberculosis of the left hip of two years' duration. She has been treated by extension in bed and plaster spica. There is a discharging sinus eight inches below the left trochanter which has existed for sixteen months.

She was first injected on October 30, 1908. Given injections at intervals of three days and then discontinued owing to tenderness about the sinus tract and a rise of temperature to 104° F. The injections were renewed a week later, until thirty-three were given in all, covering a period of four months. The wound has healed perfectly and has continued so two months after the closure.

Summary.—Tuberculosis of the hip. Cure after thirty-three injections, extending over a period of four months.

Case 5.—C., age sixteen years. He has tuberculous arthritis of the left hip. Duration of the disease eight years. The sinus has persisted for four years. The first injection with soft paste was given December 24, 1908. Fourteen injections were given in all, at intervals of three days, extending over a period of two and a half months. Ice bags were applied after injection. There was no reaction, either general or local. The sinus did not heal and the amount of discharge remained the same.

Summary.—Tuberculosis of the hip; 14 injections; no improvement.

Case 6.—F., age twenty-eight years. Patient has tuberculosis of the eighth and ninth dorsal vertebræ. The duration of the disease has been five years, and there has been a slightly discharging sinus in the right lumbar region for four years. The sinus had remained healed for one year under cupping, but broke down again three months ago. Six injections of Beck's Bismuth Paste were given. After that the injections were discontinued owing to a rise of temperature to 101° F. Associated with the rise of temperature the sinus became dilated from 1 mm. to 3 cm. in diameter, and the discharge became profuse.

Summary.—Tuberculosis of the spine; six injections; not healed, but untoward general symptoms with increase in the amount of discharge and an angry appearance of the sinus.

Case 7.—K., age six years. Tuberculosis of the hip with a discharging sinus below the right trochanter. Duration of the disease one year. The sinus has been discharging six months. Temperature normal. Was injected with soft paste for the first time November 6, 1908. After the injection the temperature rose until it reached 104° F. on the following day. The patient complained of headache and nausea. On the following two days the temperature gradually subsided until it reached 99.5° F. On the 10th of November, four days after the first injection, a second injection of 2 ounces of soft paste was given and the temperature rose to 101° F. On the following three days the temperature ranged between 102° and 104° F., and the leg was very painful. The temperature gradually returned to normal but no more injections were made for the next thirteen days. Two ounces of the soft paste was then given and the temperature again rose to 101° F. Twenty-four injections were given in all, followed each time by a greater or less rise in temperature. The period of injection covered four months. The sinus did not heal.

Summary.—Tuberculosis of the hip; twenty-four injections given. Severe general reaction. Case not benefited.

Case 8.—W., age thirty-six years. Two and a half years ago the patient felt a pain in the left leg and around the hip joint. He was treated for rheumatism and sent to Fort Bayard, New Mexico, for eighteen months. Soon after arriving there, the abscess broke out on the hip and has been discharging ever since.

Diagnosis.—Tuberculosis of the femur, running down into the neck and shaft. The patient has had practically a normal temperature for some time and the sinus on the outer side of the femur, 2 inches above the internal condyle, was injected with bismuth paste October 30, and again November 8 and 11. November 11 the temperature was up to 103.5° F., and the patient complained of feeling very chilly. There seemed to be some induration over the knee joint, and on the next day that area was very painful, tender, hard, and swollen. An attempt was made to squeeze out the bismuth which had been injected. With this came a profuse discharge. On the next day the temperature still remained up (103° F.), and there was great tenderness and tension about the knee joint. It was very evident that an infection had occurred directly in the knee joint itself, and the joint was aspirated and found full of serum, containing many pus cells. An arthrotomy was performed on the joint and the temperature fell the next day. The sinus still continued to discharge. It seems probable that the injection of the bismuth paste into the sinus, which was in close proximity to the joint, dammed back the pus so that the infection was carried directly to the joint itself. The original sinus is still discharging.

Summary.—Tuberculosis of the femur. Infection of the knee joint following the injection of bismuth paste.

Case 9.—Z., age nine years. The boy has tuberculosis of the left hip. The disease began six years ago and he has had a discharging sinus 10 inches below the left trochanter for the past five years. His general condition is fair. The temperature is 99° F. He was given an injection of 2 ounces of the soft paste. The radiograph showed the sinus to run up to the superior part of the neck and head of the femur. The evening of the injection he complained of great pain, and on the following day the temperature had reached 104° F. The discharge from the sinus was materially diminished. The patient became quite delirious. An effort was made to express the bismuth from the sinus. During the following four days the temperature gradually fell to 100° F., and the mental condition cleared up with the fall in temperature. The symptoms were probably due to a toxæmia caused by blocking up the pus within the sinus. Owing to the severity of the reaction, no more injections were made. One month after the injection an operation was performed, and the sinus led directly to the parts which the bismuth had indicated were diseased. There was no paste to be made out at the time of the operation.

Summary.—Tuberculosis of the hip, with a toxæmia following the injection of bismuth. The injection was of value as pointing out the diseased areas.

Case 10.—B., age eleven years. Tuberculosis of the eleventh and twelfth dorsal and the first lumbar vertebræ. Duration of disease was eight years. For four years there have been two discharging sinuses, one at the right lumbar region, and one at the left thigh 10 inches below the trochanter. The general con-

dition of the boy is very poor. There are marked evidences of amyloid degeneration.

On December 2 he was injected with 4 ounces of bismuth vaseline paste (Formula No. 1). There was no marked reaction following the injection. The second injection, December 19, 1908 (Formula No. 1). Third on January 7, 1909, with a hard paste. Fourth injection, January 21, 1909, and again on February 27 and March 13. That time the discharge was reduced, but there were no signs of the closing of the sinus. The last two injections were on March 22 and May 6. While the discharge is somewhat less than originally, the sinus shows no signs of closing. Thus we have eight injections, extending over a period of five months, but there is no appreciable effect so far as closing the sinus is concerned.

Summary.—Pott's disease; eight injections, distributed over a period of five months; no improvement.

Case 11.—X., age fifteen years. Tuberculosis of both hips. Both legs are flexed on the abdomen at 45°, the right adducted 15°, the left abducted 15°. There is a discharging sinus over the posterior part of the left hip.

Six injections have been given, extending over a period of three months. The sinus shows no evidence of healing.

Case 12.—L., age sixteen years. Tuberculosis of the right hip began at the age of eleven years, and six months later the left hip was similarly affected.

The right hip is in a position of flexion of 90° and adduction of 20°. There are the evidences of four healed sinuses about the hip joint, the sinuses having been closed for one year.

The left hip is flexed at 110° and abducted 15°. There is a discharging sinus pointing between the ischium and the rectum. One would suppose that the sinus led through the pelvis to the left hip. A radiograph (Fig. 2), taken after the sinus had been injected with bismuth, shows the sinus leading directly to a diseased area in the sacrum, an area which was not even suspected clinically.

Twenty-nine injections were given at intervals of three days, and extending over a period of four months, but there has been no decrease in the amount of discharge, and the sinus is still patent.

Summary.—Tuberculosis of both hips; 29 injections of bismuth without improvement. The radiograph, taken after the bismuth injection, revealed the source of the discharging area which had not hitherto been suspected.

Case 13.—W., age nine years. Boy has tuberculosis of the left hip, which has existed for three and a half years. There is a discharging sinus just to the left of the sacrum, which is three years old.

Three ounces of bismuth were injected into the sinus and the radiograph taken immediately afterwards shows the sinus extending up through the pelvis, across it, and then going through the acetabulum, to the head of the femur (Fig. 3). Nine injections of bismuth have been given, at three-day intervals, but there is no decrease in the discharge or any apparent attempt at closure of the sinus.

Summary.—Tuberculosis of the hip; nine injections; no improvement. Bismuth outlined merely the course of the sinus tract.

As a diagnostic agent to determine the course of the sinuses, to follow them throughout their devious paths, and to localize definitely the nidus of infection, the injection of bismuth paste, and its interpretation by means of the X-ray, is of the greatest value. Were there no therapeutic efficacy in the treatment whatever, the light shed upon the character and extent of the operations required would be value enough for the method.

After studying a radiograph showing the injection of paste into an old sinus coming from the inner side of the pelvis, one can readily realize why so many of our operations for the cure of the affection have failed. We could scarcely appreciate the extent of the involved area without some such graphic representation.

Take, for instance, the radiographs from cases No. 12 and No. 13, both with sinuses appearing along the side of the rectum, and both cases of tuberculosis of the hip. The injection of paste shows the tract in both cases goes up into the pelvis, and while in the latter case the paste is seen to go through the acetabulum and then out into the head of the femur, in the former case there is no sinus tract to the femoral head, but the necrotic area lies on the anterior aspect of the sacrum. Clinically there was no reason to suspect such a starting point, and the revelations of the paste indicated an operation absolutely different from what was originally intended.

If the injection of the paste and its interpretation by the X-ray is to be followed up immediately by operation, it is the general consensus of opinion that there is no danger of bismuth poisoning or toxæmia from the absorption of pus, for all the deleterious products would have been removed.

In general, cases of sinuses coming from the bone, which have been discharging, should be injected with Beck's Bismuth Paste to outline their course and to determine the exact bone involvement before operative procedures are instituted.

The injection of bismuth paste as a therapeutic agent is a greatly mooted question by various observers. The percentage of cures varies so markedly according to different writers, that we find some who are its enthusiastic advocates, while others deny it any curative properties. Perhaps there is an explanation of these different attitudes. But I think that if we make a dispassionate review of the literature, we cannot but be impressed with the fact that a larger percentage of cases are cured by this agent than by any method formerly employed, and, although the hopes of some have been dashed in not finding it a cure-all, at the same time it has increased our percentage of cures rather markedly.

Ochsner (1), writing on the treatment of Joint Tuberculosis, reports cures in 55 per cent of the cases treated.

Ridlon and Blanchard (2) divide their cases into three groups. First, favorable cases, those cases in which the bismuth forces the pus out of the sinus. Second, partly favorable cases, those with extensive bone destruction, with many ramifying sinuses. Third, "negative cases," those with retained sequestra and ramifying pockets that were so deeply and peculiarly situated, that the bismuth could not be forced into them so as to displace the pus. Out of a series of seventeen cases they report a complete healing in 53 per cent.

Beck (3) who is not only the author, but has had the largest experience in treatment by this method, reports a cure in eighty-six cases (57 per cent) of bone tuberculosis. In thirty-one cases of osteomyelitis a recovery in 65 per cent.

and in a total of one hundred and ninety-two cases, including bone tuberculosis, osteomyelitis, empyema and various fistulous tracts, recovery in 46 per cent.

Robitshek (4) reporting nine cases, only one of which, however, dealt with tuberculosis of the bone, reports a cure in 55 per cent.

Don (5), of Edinburg, heartily recommends the treatment for surgical diagnosis, but he thinks the treatment is not without dangers as a therapeutic agent. He reports a series of cases with a cure in 17 per cent.

Rosenbach (6), of Berlin, reports four cases with a cure in 50 per cent. He does not think the method, however, is free from danger.

Dollinger (7) has had two tuberculous fistulæ which healed in a short time, out of a series of sixteen cases.

In the work on the treatment of suppuration of the ear, nose, and throat Joseph Beck (8), of Chicago, is most enthusiastic as to the efficacy of the treatment. He reports a series of three hundred and nineteen cases in which there has been complete recovery in 22 per cent.

Pennington (9) reporting on the treatment of fistula in ano, reports a cure in thirteen out of his seventeen cases, or 76 per cent.

In my own cases, in which the bismuth was injected into the sinus as a therapeutic remedy, there was a cure in four out of twelve cases, or $33\frac{1}{3}$ per cent.

Thus one sees there is a varying result as reported above, ranging from 12 per cent to 76 per cent of cures. The great majority, however, report a recovery in from 40 to 55 per cent of the cases, a percentage which is far above the other therapeutic or surgical remedies. It is needless to say that most of the authors have spoken of the marked improvement, as recognized by the decrease in the amount and character of the pus, and gain in body weight, in many of these cases which are put down as cures. It has occurred to me that the differences in the results may find an explanation in the fact that the bismuth subnitrate used may be different in its manufacture or may be treated differently in its preparation in our hospitals.

First let us consider the theories as to its action.

Beck (3) has promulgated two theories. The first that the bismuth subnitrate exerts a destructive influence on the germs of the disease and that the paste acts as a trestle work by means of which healthy granulations are formed in the sinus tract. One can hardly see how the subnitrate could have any germicidal effect unless it undergoes a change in the body tissues.

Second, the other theory is that when the patient is exposed to the X-ray immediately after the injection of Beck's Bismuth Paste (Formula No. 1) the bismuth becomes radio active and thus produces healthy granulations. This can hardly be the case, as many cases injected with the paste and not subjected to the X-ray close up without its aid, as in cases No. 1 and No. 4 in my series.

Ridlon and Blanchard take the view that the bismuth paste acts only in a mechanical way, by "squeezing out the pus and by preventing the ingress of air-carried germs." If that were a sound theory one would suppose that any other paste would do as well.

Don (5), of Edinburg, has made a suggestion, which has independently been suggested by Dr. Dunning, of Baltimore, as to its curative properties, and which to me seems pregnant with meaning. He says: "It is not that the bismuth compounds are impure, but simply that they are more readily absorbed." "Is it not possible," he continues, "from the selective action of nitric acid on tubercular and other pathological tissues that the subnitrate when acted upon by the organic acids gives up its nitric acid, which attacks the tubercular wall of the cavity and forms a barrier to absorption and to further growth of the tubercle bacilli? That this is the case one would conclude from the speedy improvement that is noticed when treating ulcerating lupus patches with either pure nitric acid or acid nitrate of mercury." It seems possible that the subnitrate is hydrolyzed by the body heat and nitric acid is given off and that this is the curative agent. Of course it would be practically impossible to break down the subnitrate of bismuth and free the nitric acid by allowing the organic acids of the body to act upon it as stated by Don.

Acting on the theory that the nitric acid set free is the active agent, Dr. Dunning has undertaken to determine whether there is any difference in the way hydrolysis takes place at the body temperature in the preparations of subnitrate of bismuth from the various manufacturers of that substance. And the results have been very striking. No two give off the same amount of nitric acid at a given temperature. In fact some of the preparations hydrolyze from five to ten times as rapidly as others.

Therefore if some observers are using one preparation and some another, and the amount of nitric acid given off is therefore different and consequently much more favorable in some cases than in others, would we not expect to have considerable variation in the results seen by the respective users? This has happened to me when I have used the same technique at two hospitals. All of my cured cases were at the Union Protestant Infirmary. At the Johns Hopkins Hospital in the service of Prof. William Halsted, where I have treated some cases in conjunction with Dr. Henry Kennard, we have not obtained a single closure. Since the suggestion by Dr. Dunning we have ascertained that the preparations at the two hospitals are from different manufacturers and that the preparation which has given the cures eliminates the most nitric acid.

Beck's original paper directs that bismuth subnitrate and petrolatum should be boiled as they are mixed. It is quite conceivable that the different men who are using the paste do not use the same temperature and consequently the amount of nitrites formed varies considerably.

Not only are sinuses injected with bismuth paste, but Ridlon and Blanchard recommend the treatment of tuberculous abscesses by aspiration of the tuberculous pus and filling the abscess cavity with as much bismuth paste as it will hold. They report four cases all with complete recovery.

The number of injections necessary to close a sinus depends

upon so many factors that no definite rule can be given. Rarely one injection has sufficed to accomplish the purpose, but as noted in cases three and four, twenty-three and thirty-one injections were needed respectively. As long as there are no unfavorable symptoms it is wise to keep up the treatment.

The treatment of tuberculous sinuses with injections of bismuth paste is not without its dangers.

When used for diagnostic purposes, and to be followed immediately by operative interference, the element of danger is reduced to a minimum. But when large quantities of bismuth subnitrate are left for a long period of time within the human body one must be watchful to note the first signs of poisoning or toxæmia. Many cases of poisoning are reported after large injections of bismuth subnitrate into the stomach or bowel for diagnostic or therapeutic purposes. A far smaller number are reported in cases when the bismuth petrolatum mixture is injected into a sinus tract. still they are of sufficient number to make us watch our cases, especially when large quantities of the paste are injected and when the injections are numerous. The character of the poisoning seems to be in dispute. When the bismuth subnitrate comes directly in contact with colon bacilli, as in the rectum, the poisoning is probably due to the production of nitrites and is therefore a nitrite poisoning. Beck (10) thinks this is entirely different from the poisoning produced by the bismuth alone. The mode of the absorption of the bismuth is not quite clear. May it not be probable that if free nitric acid is eliminated that a small portion of the metallic bismuth may go into solution under those conditions. V. C. David (11) and J. R. Kauffman, of Chicago, report two cases of poisoning following the injection of Beck's Bismuth Paste. To a young man, aged twenty-four years, with a discharging sinus of the left hip, three ounces of 33⅓ per cent bismuth vaseline paste were given on September 8, 1908, and six ounces twenty days later. This was followed by a rise of temperature, salivation, stomatitis, headache, delirium, and insanity. The wound was opened and cleaned out and the patient recovered five months after the onset of the attack.

A case which proved fatal was that of a man with tuberculosis of the hip. The poisoning set in ten days after an injection of six ounces of the 33⅓ per cent mixture and the patient died twenty-seven days after the injection, with all the signs of a marked bismuth intoxication.

Don (12) reports a case of a girl twenty-one years of age, who had an attack of bismuth poisoning following the injection of bismuth paste. The injections were given as follows: Three ounces of 33⅓ per cent paste August 22, 1908; four ounces September 7; four ounces September 9; four ounces September 20. The symptoms of acute poisoning set in September 27, but the girl finally recovered.

Rosenbach (6) reports a fatal case in a patient twenty-five years of age, after eight injections. Ecchenberger (13) notes a similar fatality.

The injurious effects are not due entirely to the bismuth poisoning. Heinrich Alapy (14), of Budapest, reports the case of a young girl, in which bismuth paste was injected for the cure of a tuberculous empyema. Ten cubic centimeters of the paste was used. Ten days later the child was brought to the clinic, blind and with a paralysis of the right arm. He thought this was due to the increased hyperæmia of the cerebral vessels. The child completely recovered. Of greater interest are those cases of acute toxæmia due to a damming back of the pus, owing to the bismuth paste, as reported by Ridlon and Blanchard, and the possible infection of some neighboring joint, as reported in my series in case No. 8.

In conclusion we may say that the use of Beck's Bismuth Paste is a great advance in making an accurate diagnosis of the disease and of the direction and tortuosity of the sinuses. It affords a method of performing our operations with much more hope of success.

As a therapeutic agent it has greatly increased the percentage of cures in these tedious and trying cases.

It is not free from danger, yet with our increasing knowledge of technique this may be reduced to a minimum.

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FIG. 1.



FIG. 2.



FIG. 3.

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BLEEDING FROM THE INTESTINAL TRACT OF AN INFANT IN THE COURSE OF ALIMENTARY DECOMPOSITION IN THE SENSE OF FINKELSTEIN.—A CLINICAL NOTE.

By S. Amberg, M. D.,
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(*From the Hebrew Hospital, Baltimore, Md.*)

M. E. B., female, was admitted to the children's ward of the Hebrew Hospital at the age of two months. The family history did not present any feature indicating hereditary traits. The delivery was accomplished by the use of instruments, and the birth weight is given as 6.3 kg. The baby did not receive the breast. As far as could be made out it first received a milk dilution, then condensed milk. Later it was put on a cereal. At first the baby vomited and its passages contained curds, then the passages became very frequent, loose, greenish and slimy. Finally the bowels became constipated, the color of the stools was green and they contained mucus. During all this time the baby continued to lose weight.

On admission the baby was very much emaciated. The skin showed in several places a papular eruption. Lanugo was still present over both shoulders. The mucous membranes were of good color. The posterior cervical and the inguinal glands were slightly enlarged. The anterior fontanelle was depressed, the sutures overlapping. No further deviations from the norm could be made out at the physical examination. The temperature was subnormal, the weight 3150 gm.

The baby received every three hours (six to seven feedings in twenty-four hours) 60 cc. of food made up of 15 cc. of skimmed milk, 2 gm. of lactose and barley water with the addition of 0.015 gm. of sodium citrate. Under this regime the weight of the baby kept on the same level for five days. The bowels moved twice a day and, the stools were pasty and greenish. The food was taken greedily. During the day the baby was restless and cried when left without pacifier. During the night it slept fairly well. The respirations varied mostly between twenty-five and thirty per minute. The pulse rate, at rest, was between 95 and 110. The temperature curve showed a marked tendency toward the subnormal. The consciousness was always clear, the play of the features lively.

On the sixth day the amount of food was somewhat increased and the weight dropped promptly to 3035 gm. within twenty-four hours, without any change in the bowel movements. With a return to the original diet, the loss of weight was stopped, but soon afterwards the weight dropped again gradually falling to 2700 gm. on the last day. From the ninth day the baby received pea soup with the result that the stools became brown and formed.

The condition of the skin was very much improved under treatment. On the thirteenth day after admission the feet and hands were cyanotic, but on the next day this cyanosis had disappeared.

The ophthalmo-tuberculin reaction made on the twelfth day was negative. On the ninth day the temperature rose to 99.4° F.; it reached its maximum with 99.8° F. on the twelfth day, and remained to the end about 99° F. On the thirteenth day an enema was given because the bowels had not moved for twenty-four hours. The baby was very weak, could not take its bottle, and had to be fed with the medicine dropper. The urine obtained on the day which registered the highest temperature was clear, did not contain any albumin, and did not reduce Fehling's solution.

In the night from the fourteenth to fifteenth day the baby suddenly began to pass dark blood from the bowels. The severe and continuous hemorrhage could not be stopped by astringent enemas and the baby died in collapse.

The whole picture of the disease agrees very well with that described by Finkelstein[1] under the name of "Decomposition," and this diagnosis was therefore made. Of interest is here his note, that tar colored stools occur rather frequently in severe cases in consequence of intestinal bleeding. But Finkelstein does not speak here of severe hemorrhages. In the only case of decomposition in which he reports an intestinal hemorrhage[2] a duodenal ulcer was found. The severe bleeding in our case was regarded to be the more significant because Helmholtz[3] has described eight cases of decomposition in infants with intestinal hemorrhages due to duodenal ulcers. On the basis of those observations it was thought not unlikely that the post mortem examination would reveal the same lesions.

At the autopsy, made by Dr. José Hirsh, all the organs with exceptions of the lungs and intestines were found normal The lungs were the seat of hypostatic congestion at their bases, and the rise of temperature during the last days may have been due to this condition. The stomach and the duodenum were perfectly normal. In the lower ileum two superficial ulcers were found about 4 cm. in length and 2-3 cm. in width. Besides the mucous membrane of the intestines was more or less intensely congested. The source of the bleeding could not be detected. Helmholtz, on the basis of his observations, is justly inclined to refer intestinal hemorrhages occurring in the course of the decomposition to duodenal ulcers.

His summary is that duodenal ulcers are not very rare,

[1] Jahrbuch f. Kinderheilkunde, 1908, LXVIII, p. 52.

[2] Finkelstein, Jahrbuch f. Kinderheilkunde, 1908, LXVIII, p. 716. Case No. 63.

[3] Deutsche med. Wchnschr., 1909, XXXV, p. 534.

even in later infancy, and that the frequent occurrence of these ulcers in progressive cases of decomposition (in eight of sixteen autopsies) proves an intimate connection between these ulcers and the decomposition. But the case just reported indicates that it is not always permissible to deduce the presence of duodenal ulcers from intestinal hemorrhages occurring in the course of the decomposition. The diagnosis of the duodenal ulcer, therefore, in the ninth case reported by Helmholtz, the only one which survived its intestinal hemorrhage, does not seem to be quite firmly established.

CONVENIENCES IN LABORATORY TECHNIC.

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When so many are working along similar lines it is natural that minor schemes for simplifying labor and reducing expense should be developed, and since everyone's mind works in a different way from that of others the only hope is in an interchange of such schemes. For this reason it seems profitable to bring forward certain technical details and modifications which have been tested in my laboratory, for the benefit of those who may not have had time or opportunity to evolve them for themselves.

An Economical Pilot-Light Gas Burner.

In the many laboratories where economy of gas is desirable, and most especially in connection with classes in bacteriology, some sort of a gas burner which can be turned down without going out or striking back is very desirable. Those on the market are expensive, and furthermore most laboratories have already in stock a large supply of the ordinary Bunsens. The Welsbach by-pass for *upright* burners can be bought for about twenty-five cents, and can be easily fitted into the ordinary Bunsen. The shaft of the Bunsen unscrews, and the by-pass can be screwed directly on the thread left exposed. The small tip inside the shaft, which gives the small opening for the gas, and directs the current upwards, can also be unscrewed and inserted in the upper opening of the by-pass. In the case of most of the tips the opening at this point is too large, and it is necessary to reduce the size so that the tip will fit snugly. This can be done by setting it in plaster of Paris or by the insertion of an eighth of an inch of copper tubing of such a size that when the tip is screwed into it the whole will be secure. On account of the softness of the copper no threading is necessary. The by-pass extension tube is then bent in close to the shaft and cut off at the proper height. The life of the small tube will be prolonged indefinitely if a small piece of the clay pipe coming with the by-pass is slipped on the upper end to take the flame. The size of the by-pass flame can be regulated by the side screw, and the lever at the side, after removal of the chains, is more easily handled than the stop-cock of the more expensive varieties. We have found that the students can readily be induced to turn the gas down when not in immediate use, and the saving can readily be imagined.

Glycerine Agar in Fifty Minutes.

The frequent articles in the German press about agar in four hours, and the many personal requests as to the best way of avoiding the time consumption thought necessary in the preparation of agar appears to justify this account, though I feel sure that to many there is little or nothing new in it. It is based on the methods first elaborated by Schultz[1] in Dr. W. H. Welch's laboratory, at the Johns Hopkins Hospital, but is rather shorter.

The method refers to the preparation of agar for routine purposes, and especially for the use of students, in whose instruction it is necessary to reduce as far as may be the possibilities of error.

The materials used are agar 12 grams, peptone 10 grams, salt 5 grams, and Liebig's extract 2½ grams. Witte's peptone and Liebig's extract appear to be necessary, as the results are less good with others.

Weigh an enameled pan, preferably one with a double copper bottom, as this reduces the chances of burning, with 1200 cc. of distilled water, and record the weight. Place on the gas stove while weighing the other materials, with about 150 cc. of additional water to allow for evaporation. This is an important part of the process as it makes a greater dilution for the first solution of the materials. Add all the materials at once and boil till the whole is in solution, which should be in less than fifteen minutes. Cool to 60° centigrade by the addition of enough cold distilled water to keep the total weight up to about 150 grams over the sum of the pan, 1200 cc. water and the agar, etc. Make faintly alkaline to litmus, and add the whites only of two *absolutely fresh* eggs, beaten up in a little water. Boil, not too vigorously, until the medium boils up clear, and the egg is completely coagulated. The weight at this point should be the sum of the pan, the 1200 cc. of water, and about 50 grams for the added materials. Skim and pour into wire funnels with filters of Schleicher and Schull No. 580, which have just had boiling water poured over them. The funnels are of the type which can be bought with a rubber ring at the top for compression, but I have found them more satisfactory when the top ring is of wire with the rays soldered to it. The filter paper need not be creased, and none of us here use any outside funnel, accidents being very rare. If the room is moderately warm, filtration takes place in a few minutes, usually not requiring more than one sheet of paper divided into fourths. As soon as the filtration becomes slow repeat with a fresh piece of paper, the residual medium being reheated to the boiling point, and boiling water being poured into the paper before the introduction of the agar. As soon as the first 500 cc. have come

[1] The Johns Hopkins Hospital Bulletin, 1892, Vol. III, p. 92.

through it is the custom for the students to add the glycerine or dextrose, etc., and to tube the media while the rest is coming through. From the time that the first weighing is begun until the time when the filled tubes are placed in the sterilizer need not be over 50 minutes, and the students, even the first time, accomplish it in an hour and a half.

The resultant medium is transparent, almost colorless, unless it has been burnt when it will have a yellow color. No difficulty has been found in growing the ordinary strains of streptococcus, diphtheria or tuberculosis, and a large proportion of pneumococcus cultures show good development. The medium is firm enough for satisfactory plating, and has adequate water of condensation.

The use of distilled water is important, as also the special grade of filter paper, but the most essential points are the excess of water during the process, the absolute freshness of the eggs, and the preservation of filter paper and media at the boiling point until they meet.

Cheap Non-Vibrating Suspension for Micro-Photography.

Many articles are incomplete when published for lack of illustration and many authors omit micro-photographs where they would help materially in both the understanding of the article and its credibility, on account of the fancied expense and trouble. We have found here and doubtless this is true elsewhere, that for the average worker who is unable to use the apparatus except as a side issue, elaboration of apparatus, fittings, plates, etc., beyond a certain point does not give results proportionate to the expense. A good microscope, and a localized source of light whether Welsbach, acetylene or electric, are of course necessary and are usually accessible. Seed's or Cramer's isochromatic or orthochromatic plates are very satisfactory, and the ordinary photographic developers give excellent results. It is not my intention to suggest that the special plates, etc., are of no value, but that in the hands of the occasional worker the simpler and cheaper materials give practically the same results. With a good microscope, proper focal alignment, and a decent source of light the only technical difficulty lies in the prevention of vibration. My own work is of necessity in a room where the vibration of the building from passing street cars is so great that before meeting the difficulty I had to shut off the light till the car was past, and to do my work by preference at night. The method used for some time at Harvard, of interposing rubber balls to take up the vibration was found unsatisfactory on account of the difficulty of obtaining the right sort of ball, and bicycle tires were not sufficiently resilient. A two-inch plank, fourteen inches wide, of seasoned white wood, was purchased, and on it the various parts of the apparatus were fixed in optical alignment. It is of course necessary to have some arrangement so that the light and the collecting lens may be adjusted, though to save expense, a median fixed position may be secured with good results for all powers. The bellows should slide in the focal plane, so as to admit of looking in the eyepiece of the microscope for the area to be photographed. Two cleats of hard wood were screwed to the bottom of the plank near the ends, and through these four screw-eyes were bolted. Four pulleys were fastened in the ceiling with window cord passing from cleats on the wall through the pulleys and down to the screw-eyes in the plank. At any point between the ceiling pulleys and the screw-eyes were interposed extension springs of such a tension that the rings would be separated about an eighth of an inch when the whole weight of the apparatus came upon them. The plank and its fixtures were then raised by the cords to a convenient height, the light connected with its source and the machine was complete. The advantages which we have found in this arrangement are in the first place the absolute removal of building vibration, exposures of one second or one hour being equally clear, even with the whole affair swinging to and fro and up and down. In the second place there are no legs underneath to be kicked or to get in the way, and the plank can be pulled up to the ceiling if desired to give more space in the dark room. In the third place the plank, and the suspension cost us only three dollars, besides the time necessary for installation.

I have no doubt that the same idea has occurred to more than one, and that arrangements of this kind are to be found elsewhere, but so many visitors have appeared surprised at the simplicity of the apparatus and have requested descriptions of it that I have taken this method to comply with their requests.

NOTES ON NEW BOOKS.

Report from the Pathological Department Central State Hospital for the Insane, Indianapolis. (Indianapolis: Wm. B. Buford, 1908.)

This report opens with an earnest plea on the part of Dr. Edenharter, the superintendent of the Central State Hospital, for the establishment of scientific departments in every institution for the care and treatment of the insane. He says that: "The institution in return for the facilities for study afforded by the State should not only make every effort to encourage the resident staff to increase their practical knowledge in all branches and to carry on the work of the hospitals in a scientific spirit, but should also do all in its power to extend these advantages to the members of the medical profession and the medical students, with the idea in view of familiarizing them with the underlying principles of this branch of professional work, to the end that they may by this knowledge prevent many cases from being committed to the institutions."

Again, "hospitals for the insane, especially those supported by the State, should, for reasons economic as well as humanitarian, grasp the situation and encourage every effort on the part of the medical student to engage in and become proficient in the diagnosis and treatment of diseases of the mind and nervous system. I repeat that this policy inaugurated and continued will furnish every community in the State, with a number of practitioners specially prepared to render early and skillful assistance to those mentally afflicted; will provide a large number of graduates fully qualified from which to select hospital physicians, and will result in a saving of money to both the patient and the public."

It is gratifying to learn that Dr. Edenharter has been able to put these ideas in practice during the past year by morning courses in pathology and evening courses in clinical anatomy and also in the finer anatomy of the nervous system, combined with systematic lectures on mental disorders.

In the "Summary of Work done by the Pathological Department," Dr. Chas. F. New gives a classified summary of 147 autopsies which had been done at the hospital. The value of these records would have been much enhanced had it been possible to present with them a full clinical history. Inasmuch as one of the objects in establishing them is to show their lack of completeness and the need of better clinical notes, it is hardly necessary to call attention to this defect. The same criticism can probably be made with equal justice upon the work of every similar pathological institute. Has not the time, however, arrived when work of this imperfect and inconclusive character should no longer be tolerated? The evil should not only be pointed out and illustrated, but also remedied.

Eight papers, by Dr. New, chiefly of a clinical character, complete the volume. The review is in hearty sympathy with the views presented in the volume as to the value of scientific work in institutions for the insane. The great obstacle to putting them into practical effect is the lack of trained workers for research investigations and for teaching.

A System of Diet and Dietetics. Edited by G. A. Sutherland, M. D., F. R. C. P. (The Oxford Medical Publications. *London: Henry Frowde and Hodder & Stoughton.*)

This work is the result of the co-operation of a number of writers, under the editorship of Dr. G. A. Sutherland. The subject of dietetics is one which may be discussed in many ways; it is one on which there are endless ideas and diverse views. Every man thinks he knows a good deal about diet, certainly the best diet for himself. The cause for the views which are common among the laity is often difficult to explain, as for example the evil results which are attributed to the eating of tomatoes. Some of the ideas filter through to the public by way of the profession, thus the importance of a purin-free diet is beginning to take its place as a subject of conversation at dinners.

It may be said that the contributors to this work seem to have avoided fads and fancies. The general aim appears to have been to present general principles rather than to follow the routine method which is displayed by the man who gives his patients printed diet lists. Sir Lauder Brunton writes an introduction chapter in his usual entertaining style and Dr. Campbell follows with an account of the evolution of man's diet. This is most interesting and the conclusions might well be studied by some of those who hold that man is essentially vegetarian by nature. Early man was essentially carnivorous and did not use vegetables to any great extent until after the development of cookery. He also points out the importance of the great increase in the use of sugar in modern times with much resulting ill-health. Dr. Spriggs has given excellent chapters on the physiology of digestion and the results of experimental work on diet.

Dr. Cautley writes on diet cures, special diets, patent and proprietary foods and the invalid's dietary. He has not much that is good to say of the various diet cures. Of a purin-free diet he states that the benefit obtained is largely dependent "on its simplicity, on efficient mastication, on the limitation of intestinal putrefaction and the prevention of over-eating, which the return to a simple and limited diet involves." The article on patent foods is a valuable one and the analyses of many foods which are given are useful for reference. As he points out, such foods may sometimes be of the greatest value, but the more one knows of their composition the less often will he have recourse to them. It is a pity that some of the other contributors had not read this article before they wrote their own sections. The discussion of the invalid's dietary contains directions for the preparation of many of the simple foods which may be used for the sick.

Dr. Campbell, who writes on alcohol in health and disease, takes the view that while alcohol produces "individual deterioration, it does not cause racial deterioration." It tends to eliminate the undesirable and thus carries on "an evolution against itself." By this the race tends to become increasingly resistent to alcohol. Naturally this can only occur after there is a constant supply of alcohol and this would be the case only after the advent of civilization. Consequently those countries with the oldest civilization should be the most temperate and Dr. Campbell considers that this appears to be the case. As to combatting the evils of alcohol he points out the impossibility of banishing alcohol or of protecting the born drinker from obtaining it, but he dwells on the importance of preventing the propagation of congenital inebriates. The action of alcohol on the various systems of the body, indications for its use and dosage, are all discussed.

The greater part of the work is taken up with the discussion of the diet for various groups of diseases. It is not possible to note these articles in detail, but some deserve mention. The section on diet in tuberculosis, by Drs. Bardswell and Chapman, is excellent and they give a number of useful tables, the value of which is increased by the study of the cost. Dr. Luff gives clearly written advice on the diet in gout and hits at some of the fads. Dr. Bradford's article on diet in diabetes seems much too short and rather inadequate in view of the importance of the subject. Dr. Cautley writes on diet in obesity. In speaking of proprietary remedies for obesity he states that "fortunately thyroid extract is not used, its dangers are too great for even the most reckless advertiser." We fear that Dr. Cautley has done the proprietary men too much honor. Apparently thyroid extract is contained in some of the advertised remedies.

The articles throughout are well written and the work should be found useful by the practitioner, especially by the one who thinks for himself. The man who only wants specific directions which can be copied and so save himself the trouble of thinking may not appreciate it so much. The discussion of principles is more prominent than the giving of directions.

Gynæcology and Abdominal Surgery. Edited by Howard A. Kelly, M. D., F. R. C. S. (Hon. Edin.), etc., and Charles P. Noble, M. D., S. D., etc. Illustrated by Hermann Becker, Max Brödel and others. Vol. II. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

This, the second volume of this publication, represents the combined knowledge of the masters of surgery, in this marvelous age of surgery, and abdominal surgery especially.

Anæsthesia and antisepsis have combined to make possible this phase of the medical art, and standing as they do, in so important a relation to the success or failure of an operation, to them is dedicated the first part of the book, and following these, the no less important subject of complications *following* operations.

As the volume consists of monographs by various surgeons in their special fields, each subject receives the consideration its importance demands. Therefore, every student will find the material for his particular need. Even though this be true, to each one who studies it, one or the other of subjects will appeal with greater or less force; this being the case, one need not apologize for personal preferences, even though the function of the reviewer is to review.

In studying the book one cannot but be impressed with the very practical manner in which the subjects are discussed, making it a book of rare value to the student and the medical practitioner as well. As the elaborate, yet clear, description of symptoms, signs and treatment, medical as well as surgical, with prognosis,

seem to embody all that can be said in the limited space, it is needless to undertake an exhaustive review. Of noteworthy interest, because the subject is perennial, may be mentioned the chapter on "Diseases of the Female Breast," which is exhaustive in detail, clear in conception, and practical in its bearing, both as to diagnosis and prognosis. The illustrations are unusually good, as we would expect in a book by these authors, and good as they all are, those on Intestinal Surgery and Intestinal Repair stand out pre-eminently; they are so graphic that one feels any tyro could follow them.

It is difficult in a review to emphasize all the subjects worthy of special mention, and particularly so in a work of this kind in which each subject is the result of a life work by an acknowledged authority in his line.

Clinical Diagnosis, a Text-Book of Clinical Microscopy and Clinical Chemistry for Medical Students, Laboratory Workers and Practitioners of Medicine. By Charles P. Emerson, A. B., M. D. Second edition. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

The first edition of Emerson's Clinical Diagnosis was thoroughly reviewed in a former number of the Bulletin, but the second edition of this work is even more worthy of praise. The book is larger and fuller than its predecessor, while it is markedly superior in many features. While the bacteriology of the various secretions and body fluids received but scant consideration in the first edition, in the present volume the subject is taken up at considerable length, and with great completeness. When we consider, for example, the immense strides made within the past few years in the bacteriology of the diseases of the urinary tract, the need for the incorporation of these findings in a thoroughly up-to-date work on clinical diagnosis becomes apparent. Of the 674 pages in the work, 72 are devoted to the sputum, 248 to the urine, 88 to the gastro-intestinal contents and fæces, 231 to the blood and 18 to various other body fluids. Only the methods that have stood the test of repeated trials in the clinical laboratory of the Johns Hopkins Hospital are considered, and these are described with care and often at considerable length, so that even those who have not had a thorough laboratory training may understand their value and significance. The arrangement of each chapter we think a most admirable one; first a general and special consideration of the secretions, excretions or body fluid under discussion, and then a more rapid, though in the main a most satisfactory, survey of the diseases, of which the diagnosis, prognosis or therapy are helped to a greater or less extent by a study of the changes in these fluids. We feel that the book well bears out its claim to being a text-book for medical students, laboratory workers and practitioners of medicine, and that Dr. Emerson is to be especially congratulated for the thoroughness and completeness with which in this second edition the whole subject-matter relating to clinical diagnosis has been brought up-to-date and rendered available.

T. R. B.

The Surgery of the Ear. By Samuel J. Kopetzky, M. D., Attending Otologist, New York City Children's Hospitals and Schools; Assistant Surgeon and Instructor in Operative Surgery of the Ear, Manhattan Eye, Ear and Throat Hospital; Pathologist and Surgeon, New York Throat, Nose and Lung Hospital, etc. Illustrated with 63 half-tone and line drawings, 8 charts and 4 colored plates. Cloth, $4.00. (*New York: Rebman & Co.*)

In appearance, a very attractive book, but, in many other respects a rather disappointing one. In so far as the publisher's part of the work is concerned, the results are very satisfactory; the lightweight paper, clear type and excellent reproduction of the illustrations, do credit to the book maker. The illustrations, by the way, are well selected and the artist produced good results. The context, however, does not merit unqualified approval. There is much that is good in the book, the subject of otologic surgery being covered with a fair degree of completeness, but that hardly seems sufficient justification for the launching of a new book. Nothing new is contributed to the subject and much that is given has been presented in better form by previous writers.

When the several chapters are considered in detail there are many points that might be criticized, even though due allowance be made for the fact that the author is presenting his personal views, and full consideration be given his arguments. At the close of each chapter a list of references to the literature of the special topic under consideration is given. This does not purport to be a complete bibliography, but is supposed to be fairly representative and is recommended to the interested reader as comprising the most important publications bearing upon the subject. On glancing over the lists one can only conclude that the author's reading has been confined largely to German, French and *New York;* at least he has failed to note any worthy contributions to otologic surgery from other sources.

Operations upon the external ear, except for the scant consideration, fourteen pages, given the canal, are entirely ignored. In the second chapter, when describing aseptic preparation for operations upon the tympanic membrane, one is advised to use *Pyrozone.* What is pyrozone? There is no such preparation in the Pharmacopœia, the National Formulary nor the New and Unofficial Preparations, issued by the American Medical Association. Is it not high time physicians ceased to endorse trade-marks, when they cannot possibly have any definite knowledge of the substance they are recommending? To prescribe "proprietaries" carelessly and thoughtlessly is bad enough, but to give them admission and endorsement in our text-books is most reprehensible.

In the matter of anatomy, to which much space is necessarily given, we find several points which appear to be inaccurate and misleading. For instance, the upper portion of the tympanic cavity, commonly spoken of as the epitympanum or the *attic,* is constantly referred to as the *aditus ad antrum,* whereas this term properly applies to the canal leading from the tympanum to the antrum. The old erroneous idea concerning the relative angle of the tympanic membrane to the axis of the external auditory canal, in the child as compared with the adult, is again set forth, the following statement appearing on page 102: "As the child develops, the relations gradually change. The membrana tympani assumes a more vertical position, and the superficies meatus gradually forms a sharper angle until it approaches the adult type, namely a right angle." The position is not that of a right angle in the adult and the angle is really the same in children as in adults. The author gives evidence in support of this fact himself when, on page 103, he quotes Symington's measurements of the canal at various ages; these show the same relative angle at two months of age as found at six years.

We looked, naturally, for an expression of opinion on the employment of the blood-clot dressing after simple mastoidectomy and were not surprised that but little was said in its favor. Dr. Kopetzky seems to have been fair in his judgment of the matter, however, and holds the question open for further consideration. He has failed to secure satisfactory results in the few cases where he has tried the method and we think we can furnish at least two reasons why. In describing the technique of mastoidectomy upon children, page 109, he says, "We never curette the antrum itself, but content ourselves merely with providing drainage" Immediately after, in speaking of the dressings, page 114, he remarks, "When the blood-clot after-treatment has been elected, the outside dressings are daily removed for the first week to afford inspection of the wound." If these are not two excellent reasons for failure we miss our guess. Cleanliness, as nearly perfect as possible, of the antrum is a necessary preliminary to the use of

blood-clot dressing, and meddling with the wound purely out of curiosity is a pretty sure mode of introducing infection and causing a break-down of the clot.

Another special question in which we were much interested relates to the proper time to perform ligation of the internal jugular vein when infection of the lateral sinus is supposed to exist. An attempt is made to determine indications for ligation before, at the time of or after the sinus operation; in our opinion a most unnecessary and useless elaboration of a simple problem. The practical argument of results is strongly in favor of preliminary ligation whenever it is proposed to open the sinus. To put up the argument against this that ligation may cause "sudden and transient mania" is not very convincing; would not one prefer an early operation with sudden and *transient mania* to a delayed operation with slow but *permanent death?* H. O. R.

Frühdiagnose und Tuberkulose-Immunität unter Berücksichtigung der neuesten Forschungen: Konjunktival-und Kutan-Reaktion, Opsonine, etc., speziell der Therapie und Prognose der Tuberkulose. Ein Lehrbuch für Aerzte und Studierende. Von Dr. A. Wolff-Eisner, Berlin. Mit einem Vorwort von Geh. Med.-Rat Prof. Dr. H. Senator und Geh. Med.-Rat Prof. Dr. A. Wasserman. Mit 7 farbigen lith. Tafeln, 1 schwarzen Tafeln, 14 Kurventafeln, zahlreichen Abbildungen und Kurven im Text. Zweite vermehrte Auflage. (*Würzburg: Curt Kabitzseh (A. Stuber's Verlag), 1909*).

This is a remarkable book that Wolff-Eisner has written. He projects a hypothesis to explain the tuberculin reaction and tuberculosis immunity and has collected an astonishing array of evidence, clinical and experimental, to sustain it. The book is fuller and more orderly arranged than the first edition and he has added an abundance of material and many new view points which the work of the past year has developed. His vast and intimate acquaintance with the literature on immunity and tuberculosis is a matter of constant wonder. His arguments are forceful and his deductions clear and pointed. Whether his views will stand or not they are certainly those that fit best into what we at present know about tuberculin and tuberculosis and they cannot fail to lend renewed enthusiasm and stimulation to thought and work in this field. The cutaneous and conjunctival reactions sink into insignificance beside these broader principles of immunity to which they have pointed. Nothing new of a practical nature has been added that was not in the first edition, but the significance of the tests has been extended into such general fields as tuberculosis prophylaxis, the fight against tuberculosis as a social disease, military service, life insurance and sanatorium admissions and statistics. Although many investigators will not agree with some of Wolff-Eisner's conclusions, much is offered to support them. This unstinted praise the reviewer has written immediately upon finishing the book and in the enthusiasm created by such a mass of information and by so many new and striking aspects of troublesome questions in the tuberculin reactions and tuberculin therapy.

There is one unfortunate feature about the book that detracts from the pleasure it otherwise gives. We in America can scarcely realize how one can be so acrid on trivial questions of priority. Wolff-Eisner feels that the French have stolen much of the credit of his work with high-sounding names. Widal with zytodiagnosis, Richet with anaphylaxis, and grossest of all, Calmette with ophthalmodiagnosis. One cannot help but compare the dignified and courteous silence that Calmette has observed. Wolff-Eisner has, too, a way of constantly obtruding his own work, which gives offense, and he displays slight consideration for those who have dared oppose his views and still less for the innocents who have failed to acquaint themselves with them. Even granting that he is right in all he says and that we admire him for the admirable book he has written, a little more reserve and a little more kindliness would make him not less respected and certainly more loved.

L. H.

The National Standard Dispensatory. By Hobart Amory Hare, B. Sc., M. D., Charles Caspari, Jr., Ph. G., Phar. D., and Henry H. Rusby, M. D. (*Philadelphia: Lea & Febiger, 1908.*)

The most striking feature of the new edition is its size. It contains two thousand and fifty pages; two hundred more than the previous edition, which, of course, makes the handling somewhat difficult. It should be published in two volumes, at least. The size, however, becomes infinitely small when compared with the vast amount of information contained therein.

The volume contains every drug and preparation of value used in pharmacy and medicine at the present day. The chemical formulas, physical and chemical properties, tests, impurities, physiological action and therapeutic uses are given in detail. The United States Pharmacopœia, eighth decennial revision, with the most recent changes, is given in its entirety. The National Formulary, which has become of great use since the improved last edition, is also to be found in abstract. A valuable addition to the new volume is the complete "Pure Food and Drugs Act" passed by Congress in 1906.

The volume can be highly recommended to the profession as being the most complete up-to-date book of its kind ever published. J. L. W.

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THE TWO SYLVIUSES.
AN HISTORICAL STUDY.

By Frank Baker, M. D., Ph. D.,

Professor of Anatomy, Georgetown University, Washington, D. C.

I. Jacobus Sylvius.

In the history of anatomy certain figures stand out in a light that tends to confuse the vision of surrounding objects and give a false impression of contemporary characters. The principal one of these figures is Vesalius. The dramatic history of his life as related by himself is well known; how, when he was a pupil in Paris, under Sylvius, he corrected the work of his master, and how, after he published his great "Fabrica," which reformed anatomy and divorced it from barren scholasticism, he was violently attacked by Sylvius, because he had dared to correct obvious errors of Galen. This controversy, by bringing Sylvius into somewhat unpleasant notoriety, has influenced to a considerable extent our judgment of him, and has even caused a distortion of certain facts regarding his work and discoveries.

If we turn to the Century Dictionary of Proper Names we find:

"*Sylvius* (Jacques Dubois). Born at Amiens, France, 1478, died at Paris, 1555. A French anatomist, lecturer on anatomy at Paris. He made various anatomical discoveries, and invented injection. From him the Sylvian aqueduct, the Sylvian artery, and the Sylvian fissure (of the brain) were named."

Similar statements are found in many authoritative works.[1]

Sir Michael Foster, in his excellent "Lectures on the History of Physiology," says, p. 5:

"We daily, in the present time, name him [Jacobus Sylvius] when we speak of the fissure of Sylvius."

Sir Benjamin Ward Richardson, in his "Disciples of Æsculapius," Vol. I, p. 79, says, speaking of the anatomists contemporary with Vesalius:

"They were conspicuous for the close attention they paid to particular parts, Sylvius to the brain, ... ; and from the special studies in these particular directions they connected their names so intimately with the parts they dissected and described, that their names have become, like the parts themselves, one and the same in literature: . . . . as the fissure of Sylvius."

And also, p. 77:

"He [Vesalius] was studying human anatomy under Sylvius, at that time the light of his age, and still a light, through his researches on the brain, by which he is ever identified."

A compilation of the authorities mentioned shows that it is the widely accepted opinion that Jacobus Sylvius made discoveries in the anatomy of the brain, that we especially owe to him the fissure, artery and aqueduct of Sylvius; that, besides

[1] A hasty search has produced the following list, which doubtless might be considerably extended: Baas, Outlines of the History of Medicine, 1889; Foster's Medical Encyclopedia and Dictionary, 1894; Johnson's Universal Encyclopedia, 1895; The Sydenham Society's Lexicon of Medicine and Allied Subjects, 1899; Gould's Illustrated Dictionary of Medicine, 1903; The New International Encyclopedia, 1904; Kemper, The World's Anatomists, 1905; Dorland's Illustrated Dictionary of Medicine, 1906; Nelson's Encyclopedia, 1907; Meyer's Konversations-Lexikon, 1908; Brockhaus' Konversations-Lexikon, 1908; Locy, W. A., Biology and its Makers, 1908.

these, there have at times been named as his discoveries, or in his honor, the Sylvian ventricle (fifth ventricle), the Sylvian valve (Eustachian valve of the heart), and the *caro quadrata Sylvii* (flexor accessorius muscle of the foot); also that he invented injection of vessels for purposes of anatomical demonstration.

It would seem that these eminent authorities ought to have questioned such statements as these in view of the well-known fact that the physiology of the brain was totally misunderstood until long after that period and that no great amount of attention was given to its structure by any anatomist until the science was much farther developed. Knowing that Vesalius, the pupil and prosector of Sylvius, was ignorant of most of these matters, it seemed to me strange that Sylvius should know of them, and some years ago I satisfied myself that the statements so generally current are wholly or partially wrong and recently I have examined the works of Jacobus Sylvius and other authors in order to determine where credit should properly be given. I have found that the modern world, while exalting the discoveries of this man beyond what they deserve, has also done scant justice to his real merits, and for this reason I have prepared a brief account of what he really did and did not do.

First, let us see what foundation there is for the generally accepted statements.

No mention of the fissure of Sylvius occurs in the works of Jacobus Sylvius nor in those of any previous or contemporary author. No particular mention is made of the Sylvian artery (middle cerebral artery). While he describes a passage from the third to the fourth ventricle, this was mentioned previously by Galen, Oribasius, Berengarius and Vesalius. He nowhere calls it an aqueduct, and there is some slight doubt whether the passage he mentions is really what we now call the aqueduct of Sylvius. He probably never saw the fifth ventricle; though, like Vesalius before him, he describes the septum lucidum in an imperfect manner. He does describe a fold on the wall of the heart at the entrance of the inferior vena cava, so that we may not improperly assign to him, instead of to Eustachius, the discovery of the Eustachian valve. He describes a "*moles carnea,*" not a *caro quadrata,* as existing on the sole of the foot, in the situation of the flexor accessorius, but in this he only followed Oribasius, who mentions the muscles attached to the long flexor of the toes. As to the injection of vessels it would seem that his merit is not great. He says:

> "You may effectually ascertain the distribution of vessels by blowing through tubes, which I approve rather than endeavoring to supply the place of the blood by means of a liquid tinged with saffron, wine or otherwise colored. For when these liquids flow out they confuse the dissection by their color." [2]

There was no effective use made of liquid injections until long after the day of Sylvius. It may be mentioned also that if the mere fact of injection is to be considered, the honor belongs to Berengarius, for he mentions in his Commentary on Mundinus, published thirty-four years before Sylvius's anatomical works, that he had injected the renal veins.[3]

We see by this that the accepted reports as to the discoveries of Jacobus Sylvius have but little foundation in fact. Let us see now something about the man himself, and find out what he really did.

Jacques Dubois was born at a little village called Louvilly, near Amiens, so that when he became a scholar and had, after the fashion of the time, to assume a Latin cognomen, he called himself Jacobus Sylvius Ambianus, as Andrew Wesel from Brussels called himself Andreas Vesalius Bruxellensis. His father was a weaver, the family was poor, there were fifteen children, eleven boys and four girls. Jacques was the seventh child. An older brother, François, became the principal of the college of Tournay, near Paris, and was able to secure the admission of his brother to that institution. Here Jacques showed extraordinary zeal for the study of languages, and mastered thoroughly Latin, Greek and Hebrew. A French grammar composed by him was long a classic, and he was the author of a poem celebrating the meeting of Henry VIII and Francis I on the Field of the Cloth of Gold. He also excelled in mathematics and invented machines for transportation by water. He soon, however, became interested in the structure of the human body, being led to it from a careful perusal of the works of Hippocrates and Galen. He appears from passages in his works to have used every opportunity that chance threw in his way for examining bodies: a mason killed by a fall from a roof, a woman dying in childbed, etc. He was equally active in the study of pharmacy, visiting the shops of apothecaries, and even traveling to distant cities to learn of pharmaceutical methods. He was unable, through poverty, to defray the considerable expense of obtaining a degree, but his erudition in medical matters was so well known that there gathered about him a considerable number of pupils, and he was so successful that the Faculty of Medicine at Paris forbade him to teach, as it interfered with the regular schools. He, therefore, betook himself to Montpellier, the celebrated university in the south of France, and after taking a course there which undoubtedly included the dissection of human bodies, he obtained a bachelor's degree, June 28, 1531. He returned to Paris; reopened, at the college of Treguier, his classes which soon became famous and were thronged with students, the number sometimes reaching 400 or 500. It was here that came Vesalius, Servetus, Stephanus, Gesnerus, Vulpinus and others famous in the annals of anatomy. To assist his students he formed a library, a cabinet of osteology and another of materia medica.

Moreau says:[4] "In order that he might attend more conveniently and carefully to his duties he selected a house among the surgeons, to whom *from olden times* [ab omni patrum memoria] four of the Parisian physicians appointed by the

[2] Jacobi Sylvii Opera Medica, p. 128.

[3] Commentaria in Mundinum, p. clxxviii, b. 1521.

[4] Jacobi Sylvii Vita, p. ii, b. Prefixed to Opera Medica Jacobi Sylvii, 1635.

Faculty for that purpose were accustomed to teach the art of dissecting upon at least four human bodies during each year."

His system appears to have been an eminently practical one. He had learned by experience the value of dissection, and in his little Introduction to Anatomy, he says:[5]

"I would have you look carefully and recognize by eye when you are attending dissections or when you see anyone else who may be better supplied with instruments than yourself. For my judgment is that it is much better that you should learn the manner of cutting by eye and touch than by reading and listening. For reading alone never taught anyone how to sail a ship, to lead an army, nor to compound a medicine, which is done rather by the use of one's own sight and the training of one's own hands."

* * * * * * * * * *

"You would do well to dissect the bodies of those who have died of some disease in order that, by recognizing the cause of the malady, you may treat others wisely. Do not dissect only the bodies of men, but also those of monkeys and other animals similar in many respects to man. Yet I will recommend that at first you should work only upon human bodies, thus you will obtain a profound knowledge of the different parts of man which you can apply in dissecting other animals."

* * * * * * * * * *

"Now many do not like at first to view the dissection of man and cannot endure it without great disturbance of mind. Notwithstanding this, they ought, if they can, to accustom themselves from the very beginning to look diligently at the body of man while it is being dissected, and then to perform the dissection with their own hands. For this simple manner of learning is the shortest, most certain and easiest to retain."[6]

Similar practical ideas were developed by him concerning materia medica, in the teaching of which he was equally famous. In a suburb of Paris he had a house with a garden in which he grew medicinal plants, both indigenous and foreign, in order that he might teach his classes by inspection and observation in the shortest and easiest way. This was, you will remember, quite anterior to the establishment of botanic gardens.

In the excellent article on the history of anatomy in the ninth edition of the Encyclopedia Britannica, Sir William Turner has been very unjust to this hard-working and useful man, misled, doubtless, by the captious remarks made by Vesalius in the dedicatory epistle to the Emperor Charles V, prefixed to the Fabrica. He says that Sylvius betook himself to medicine from inordinate love of money, certainly a novel incentive for entering a profession whose members have usually been notoriously ill rewarded by the world's goods. Also that he acquired his medical degree "at the ripe age of fifty-one." No mention is made of the fact that he had been studying and teaching for many years previously. Further, that "a human body was never seen in his theatre," which certainly is contradicted, not only by the general tenor of Sylvius's works, but by the general reputation given him by his contemporaries. Vesalius was in the habit of making derogatory remarks about his preceptors that do not bear close scrutiny. It is incredible that he should have staid with Sylvius for three years if he had had no opportunity to learn anything while with him. The generally received opinion, that Vesalius sprang like Minerva from the head of Jove, armed cap-a-pie, and broke the record of all previous ages by dissecting the human body for the first time, does not bear critical examination. Without wishing to detract in any way from his well-merited fame, it seems quite certain that he must have been indebted to his master for a good deal, and that the foundations of the Fabrica were laid in Sylvius's laboratory.[7]

It is well established that the anatomical writers of that

[5] Opera Medica, p. 127.

[6] Loc. cit.

[7] It is not generally understood that dissection of the human body, as then practiced, was by no means uncommon in the pre-Vesalian epoch. As early as 1240 the Emperor Frederick II issued an order that a cadaver should be dissected before assembled physicians and surgeons once every five years. He also exhorted the students at the university of Salerno to give special attention to anatomy, and ordered that no surgeon should practice until he had given proof that he had studied anatomy for a year.

At Bologna dissection appears to have been practiced quite early, for in 1302 we find a medico-legal autopsy ordered by a judge, and in 1319 grave-robbing had to be legally suppressed. In 1341 Gentilis records the finding of gall-stones in a cadaver. In 1366 the university of Montpellier decreed an annual dissection, and in 1368 Venice did the same. In 1388 Florence passed a decree allowing bodies to be delivered for dissection. In 1391 King John of Aragon directed that bodies of criminals be delivered to the university of Lerida for dissection. In 1404 a public demonstration of anatomy was held at Vienna. In 1405 an annual demonstration was decreed at Bologna. A male criminal was dissected at Padua in 1429 and a female in the following year. In 1446 an anatomical theatre was erected at Padua. The university of Bologna decreed in 1442 that a male and a female body should be dissected annually. Padua, Ferrara and Pisa did the same. In 1460 a demonstration was held at Prague, in 1478 at Paris, 1485 Tübingen, 1493 Paris again. In 1483 the Paris Faculty decreed that anatomical knowledge should be required of baccalaureates in medicine. I have already alluded to Moreau's statement that four dissections annually were expected there. In 1496 it was ordered that the remains from dissections be buried in consecrated ground. In 1495 statutes regulating dissection were passed at Vienna, and during the same year Michael Angelo was dissecting at Florence in the cloisters of Santo Spirito, the prior of the cloisters furnishing him with cadavers.

Many dissections must have occurred at Florence, as sketches by Pollajuolo, Verocchio, Leonardo, Donatello, Raphael, Bandinelli and others show that they were well acquainted with the anatomy of the muscular and osseous systems. Leonardo is said to have remarked in 1516 that he had dissected more than 100 subjects. As to his anatomical drawings, William Hunter says, "I expected to find in the drawings of Leonardo da Vinci at most only the anatomical indications indispensable for a painter in practicing his art; but to my great astonishment I discovered that Leonardo had studied anatomy as a whole and that very profoundly. When I consider the care with which he studied every part of the human body, I am persuaded that he ought to be considered the best and greatest anatomist of his epoch." These drawings all antedate Vesalius and quite recently it has been alleged that Vesalius must have plagiarized from them.

Pope Clement VII (1523-24) granted the practice of dissection at Rome as an aid to medical instruction. At Louvain, Vesalius's university, a dissection was performed in 1518. It could hardly have had any effect upon the great reformer of anatomy, as he was only four years old at the time. Records of dissections at Padua

period practiced the rude dissecting current at that time. There is no doubt but that Mundinus performed many dissections. He especially says that in 1315 he dissected two subjects. Montagnana, at Padua, speaks in 1444 of fourteen dissections at which he had assisted. Massa, at Venice, states that between 1524 and 1536 he performed nine; Benedetti, that he, himself, used bodies; Berengarius, that he dissected more than 100 cadavers, examining more than 100 heads to settle the vexed question of the *rete mirabile*. He says that he has before him the parts which he describes. Stephanus says that anatomy cannot properly be learned except upon the human cadaver, and his works show that he must have dissected. It is eminently so also with the works of Sylvius. Again and again we see that he must have carefully traced out the muscles, arteries and nerves that he describes.

Sylvius had a prejudice against anatomical drawings based upon his experience with crude, inartistic representations. He especially inveighs against the pictures of Berengarius.

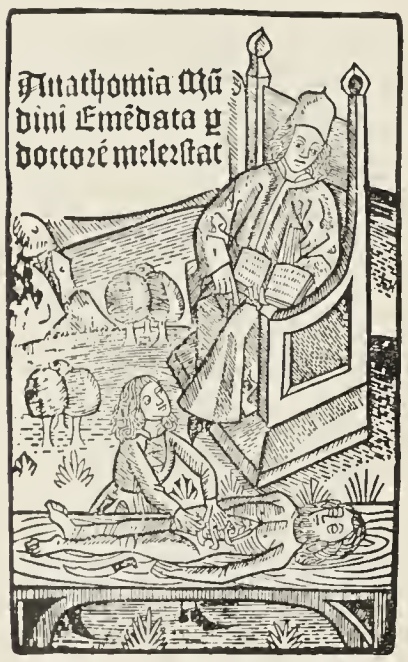


Fig. 1.—A Dissection as Understood in the Fifteenth Century. From Melerstat's edition of the Anatomy of Mundinus, 1493.



Fig. 2.—Muscles of the Abdomen as Shown in Early Illustrations. From the Anatomia of Berengarius Carpensis, 1535.

"They can," he says, "at best, only serve to gratify the eyes of silly women [mulierculis oculos pasturis], to the true physician they must always be a hindrance, for it is his duty to view and handle the body as a whole and in all its parts, becoming acquainted with the substance, size, number, shape situation and connections of each as far as the fingers can reach, not confining this examination to the surface, the only portion that can be represented in pictures." [8]

Sylvius's methods, as shown by his works, were simple, elementary and eminently clear. He followed Galen blindly, it is true, but he simplified and reduced to the common understanding the garrulous and sometimes obscure text of his favorite author. In some respects he improves upon Galen and even upon his brilliant pupil, Vesalius. The writers of antiquity were not strong in myology. Galen says that the muscles are so numerous that they cannot well be described, since they often unite so as to seem to form but a single organ, but yet when they divide there seem to be as many organs as there are tendons. He named the platysma, the deltoid, the diaphragm, the intercostal and abdominal muscles, but designated the others of which he speaks by number, as the third muscle of the arm, the fifth muscle of the leg, etc. His nomenclature was followed by other authors, including Vesalius and Fallopius, but Sylvius, with an instinct for clarity of expression characteristic of a Frenchman, gave them separate names, most of which are retained in our nomenclature to-day. He says:

"Since it is difficult to remember the muscles if they are distinguished merely by number, as first, second, third, etc., we have thought best to apply to them special names in order to be more clear, and that they may be better retained in the memory, sometimes taking such names from the parts to which they are attached, such as the brachialis, the tibialis, the peroneus; at others from their shape, as the scaleni, the rhomboidei, the serrati, the lumbricoides, the soleus; again from their size, as magnus, parvus, longus, brevis; or from their substance, as carnosus, membranosus; or from the number of their heads, as biceps, triceps." [9]

He also applied a similar system to the vessels which Galen had not named, and we owe to him the names of jugular, subclavian, phrenic, axillary, renal, spermatic, pudic, femoral, popliteal, gastro-epiploic, superior and inferior mesenteric, and many other vessels. He did not name the nerves in this way, and it is probably owing to this that to-day we quite generally designate them by number instead of by their special characteristics.

This reform in nomenclature was greatly praised by the authors who immediately succeeded Vesalius. Riolanus, celebrated as the opponent of Harvey, who rarely speaks well of anyone, says (Œuvres Anatomiques, Paris, 1629):

"Jacobus Sylvius is the first who showed anatomy in the proper way, expending upon it an amount of labor and keen intelligence that are admirable. His Introduction to Anatomy, published after his death, is the work of a highly trained mind [un esprit fort poly] and would doubtless have been without an equal had it received the final touches from so distinguished a scholar. As it is there is more merit in this little book than in the big folio of Vesalius."

This is, of course, extravagant and unmerited praise, but it is given by a man who was at the very head of the anatomical teaching of his time, and whom Harvey addresses as the "prince of anatomists."

There was, undoubtedly, an unpleasant side to Sylvius's character. He had had a long struggle with poverty which made him narrow and avaricious, and he was probably not a very agreeable preceptor. We may, perhaps, dismiss as the idle gossip of students some of the tales that are told of him, such as his keeping his servants on bread and water,

exist for 1520, 1532, and the winter of 1536/7. Vesalius commenced his course there December 6, 1537.

For most of these data I am indebted to Puschmann's History of Medical Education, Roth's Life of Vesalius and Duval's Anatomie des Maîtres, where the original authorities are cited. No doubt the actual number of dissections was considerably greater than is shown by these scattered and desultory records.

[8] Ordo et ordinis ratio in legendis Hippocratis et Galeni libris, Opera Medica, p. 5.

[9] Opera Medica, p. 101.

never affording a fire, and carrying a billet of wood up and down stairs to keep himself warm.

He is said to have been short of stature, but robust and square set (quadratus), wearing abundant hair and a rough beard. His manner was austere and rude, his voice, while flexible, was strong and inclined to be harsh, he was quick of intelligence, ready at repartee, of tenacious memory, of sound judgment.

Doubtless the young Vesalius, rich, belonging to a family favored at the Emperor's court, impatient of restraint and bubbling over with enthusiasm and novel ideas, was a good deal of a trial to the old man. Budding geniuses of that kind are usually thorns in the side of conservative elders. The story of the quarrel is about all the present generation remembers. Vesalius published his great book, a matter at that time of enormous expense. It was far superior to anything that had ever before appeared in the history of the world. Sylvius, probably deterred by the cost, had not published his. That this favorite of fortune should so easily leap into the seat that he thought he had a right to occupy undoubtedly rankled in the old man's mind. Yet it was not so much for himself that he took up his weapons—his favorite author, Galen, was attacked. Now Galen was a great man, one of the greatest in the history of medicine. We should not forget that we owe much to him and that he far surpassed Vesalius in scientific insight and physiological experimentation. The force of his intellect and scientific imagination was such that he easily dominated all physiological thought until long after the time of Vesalius, who was, himself, really a Galenist. With the opportunity for investigation that Vesalius had Galen would probably have discovered the circulation of the blood, but Vesalius was blind to this great generalization though he knew of the valves of the heart, of the impermeability of the septum, and had possibly discussed the pulmonary circulation with Servetus and the valves in the veins with Stephanus and Fallopius.



Fig. 3.—Portrait of Jacobus Sylvius. By Mich. Foulto.

To Sylvius this attack on Galen was nothing less than impious. Still, at first, he used considerable moderation, he wrote to Vesalius, recognizing his talents, but suggesting that he was mistaken, and offering to continue his friendship if he would recall what he had said about Galen. This olive branch was not accepted. Vesalius replied sharply that he had told the truth when he said that Galen did not dissect the human body, and challenged the students of Sylvius, who had been rather active in their attacks, to a trial; saying that they would do well if they would use their scalpels for dissection instead of for sharpening pens to calumniate him.

Sylvius could still have prevailed if he could have kept his temper. Vesalius had made many mistakes which were afterwards pointed out by Eustachius, Fallopius and others. Had Sylvius frankly accepted the undoubted fact that Galen was not fully acquainted with the anatomy of man, and brought only reasonable arguments against the young Fleming, he would have probably held his own as the chief anatomist of the age. The truth is that the fame of Vesalius was seriously reducing Sylvius's classes, and this was more than the crabbed sexagenarian could stand. He wrote the famous libel known as the Refutation of the Calumnies of Vesanus (a bad pun on Vesalius) in which he brought forward the most fantastic arguments to show that Galen always described the structures of man, not those of apes. He lacked the quiet poise that is the final touch for a great scientific investigator; he could not, like Harvey, quietly wait for years for the conclusion of his experiments; he could not, like Darwin, say, "If my views are not correct I should be the last to wish them to prevail." He destroyed his position by his own passion, and the world remembers his avarice and his scolding rather than his real merits.

The battle was never doubtful; Vesalius won, his work was adopted as a standard throughout Europe.

At seventy-seven years of age the grim visitor whom all must meet approaches our soured and melancholy old man. Even at the last he is jeered at by his pupils. In the delirium of his last agony he fancies that he must get up and go to his work. So he totters out of bed, draws on his boots and dies on a settle in front of the fire. This was the occasion of a skit entitled Sylvius Oereatus or Sylvius-in-Boots (alluding to Puss-in-Boots) in which the old man is said to have put on his boots in order that he might cross the Styx without paying Charon his fee. Even where his last obsequies were held the students must have their cruel fun. One of them wrote this mock epitah in chareoal on the walls of the church:

"Sylvius hic situs est, gratis qui nil dedit unquam,
Mortuus, et gratis quod legis ista dolet."

"In this grave lies old Sylvius, during his day
He never gave aught without getting full pay;
And though dead as a herring, so nought could be worse.
He is vexed he can't charge you for reading this verse."

It would seem that the old man must have had some premonition that posterity might not properly value his work, for he says, at the end of his Introduction to Anatomy:

"In addition, O good and gentle readers who have undertaken the study of medicine and who now under my guidance and leading have entered upon the reading of the anatomical books of Hippocrates and Galen, show always that you are not ungrateful and that you have a just regard for what, for the love of you, I have done."

He had no wife to follow him to the grave, no family ties, no children to brighten his home and to love and cherish his memory. He was buried in the Cemetery of the Poor Scholars, and I think that if I had been in the funeral train when this poor scholar passed to the final peace, I should, in spite of the jeers of the students, considering what we owe to him, have placed a wreath upon his coffin. Many such tributes were afterward paid to his memory. Here is one, written by a certain Johannes Sambucus:

"Barbariem purgat, revocat meliora docendo,
Audit decrepitum concio multa senem:
Pharmaca correxit: nimirum tribuisse Galeno
Dum studet, errores detegit usque suos."

"Unto the barbarous throng he wisdom brought,
E'en in old age great crowds his teaching sought.
Our pharmacy he helped: by zeal for Galen led,
His master's faults he hid and showed his own instead."

II. Franciscus de le Boë Sylvius.

We have still to ascertain to whom we owe the fissure, ventricle and aqueduct of Sylvius.

As to the fissure there is no difficulty if we go back to the authors of the seventeenth and eighteenth centuries. Haller, writing in 1774, says in his Bibliotheca Anatomica, Vol. I, page 389:

"Franciscus Sylvius (de le Boë) described the fissure which bears the name of its discoverer."

Thomas Bartholin, in his Anatomy, says (I quote from the English translation published in London in 1668):

"The windings of the brain (which I first learnt of Franciscus Sylvius, a great anatomist) if you diligently examine the matter you shall find to descend a good depth and that the brain doth gape on each side, over and above that same middle division made by the Sickle, with a winding clift, which begins in the forepart, about the roots of the Eyes, whence according to the bones of the temples, it goes back above the root of the spinal marrow, and divides the upper part of the brain from the lower part."

This is practically a translation of a note found on p. 262 of the Institutiones Anatomicæ of Caspar Bartholinus, father of Thomas, published in 1641. This note is placed in brackets and signed F. S., which is explained as indicating Franciscus Sylvius. It appears to be the first mention in literature of the fissure and artery of Sylvius.[10]

A similar passage occurs in Franciscus Sylvius's Disputationes Medicarum, first published in 1663, pp. 43, 44.

"The whole surface of the cerebrum is everywhere quite deeply marked by gyri similar to the convolutions of the small intestines, and especially by a notable *fissure* or *hiatus*, beginning at the roots of the eyes [optic tracts], passing backwards along the temples above, not farther than the roots of the medulla [crura cerebri], and dividing the cerebrum on either hand into an upper, much larger part and a lower, smaller one; with gyri occurring the whole length and depth of the fissure, I may even say with the beginnings of lesser gyri at the very upper part of the root."

About the date of this publication mention of this fissure appears widely in literature, always evidently based upon this description.[11]

The fifth ventricle (Sylvian ventricle, pseudo-ventricle, ventricle of the septum) was first described by Franciscus Sylvius in his Disputationes, as follows:

"To our surprise we chanced to observe last year that there is a *hiatus* where the corpus callosum begins to thin out into the septum pellucidum. Although the septum is very thin it is divided into two layers. This we demonstrated a number of times to spectators."

As to the aqueduct we shall have to go much farther afield to properly ascertain the rights of discovery.

It was generally supposed by the anatomists of the Vesalian epoch that Galen had described this passage. That author says in his treatise, De usu partium:

"As all the nerves of the body that are distributed to parts below the head are derived either from the cerebellum or the spinal cord, the ventricle of the cerebellum [fourth ventricle] must be of considerable size so as to receive the psychic pneuma elaborated in the anterior ventricles; there must therefore be a canal between those ventricles and it. The ventricle is indeed large and the canal which from the anterior ventricles ends in it is very large also. This canal gives the only communication between the cerebrum and the cerebellum. . . . . The cerebrum, being separated from the cerebellum by the fold of dura mater [tentorium], has to be attached to it at least in one point in order to form the above-mentioned canal, and its two ventricles end at the same point. . . . . To suppose that the conarium [pineal body] regu-

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[10] This passage is probably of sufficient importance to be given in the original:

"(F. S. Anfractus quod in fig. 5 factitatum, si diligentius examinaveris, eo satis profunde descendere comperies, cerebrumque hiscere utrinque per anfractuosam fissuram, quæ in parte antica circa radicem oculorum principium suum habet, unde secundum temporis ossa retro supra spinalis medullæ radicem procedit, ac cerebri partem superiorem ab inferiore dividit.

"Arteriarum carotidum rami hic plurimi feruntur, tum in superficie, tum in fundo, quibus molesta illa in quibusdam capitis doloribus circa temporum regionem pulsatio accepta videtur referenda.)"

[11] A diligent search among modern authors has shown that they are not all ignorant as to the discoverer or describer of the fissure. I cite the following:

Haeser, Geschichte der Medicin, Vol. II, p. 311: "Eben so verdienen die Untersuchungen des berühmten De le Boë Sylvius über die Basis und die innere Theile des Gehirns, namentlich die noch jetzt seinen Namen führenden Grube, erwähnt zu werden."

Pagel, Geschichte der Medicin, p. 253, has a similar passage.

Poirier, Traité d'Anatomie Humaine, Vol. III, p. 346, says: "La scissure de Sylvius porte le nom de Le Boë Sylvius, anatomiste du XVIIe siècle."

Landouzy & Jayle, Glossaire Médicale, 1902, and Fort, J. A., Anatomie descriptive, 6th ed., Vol. III, 1902, also give credit to Franciscus de le Boë Sylvius.

lates the passage of the spirit is to misconceive the function of the vermiform process, and to give to the gland more importance than it deserves. . . . . This gland forms no part of the cerebrum and since it is attached outside the ventricle how can it have so powerful an action upon the conduit? . . . . If it is supposed that there ought to be near the canal a part suitable for regulating the entry of the spirit, that part is not the conarium, but the process like a worm which extends into the whole conduit [inferior vermiform process of the cerebellum]. . . . . On each side of the conduit there are thin elongated eminences of the brain called the nates [corpora quadrigemina]. They join like the thighs of a man that touch each other. . . . . The right and left parts of the canal are formed by these bodies, the superior parts are covered by a thin membrane which is attached to the corpora quadrigemina on either side."

Daremberg [12] remarks with regard to this that Galen probably did not see the aqueduct at all, but described the subarachnoid space extending from the third ventricle between the corpora quadrigemina and the inferior vermiform process,

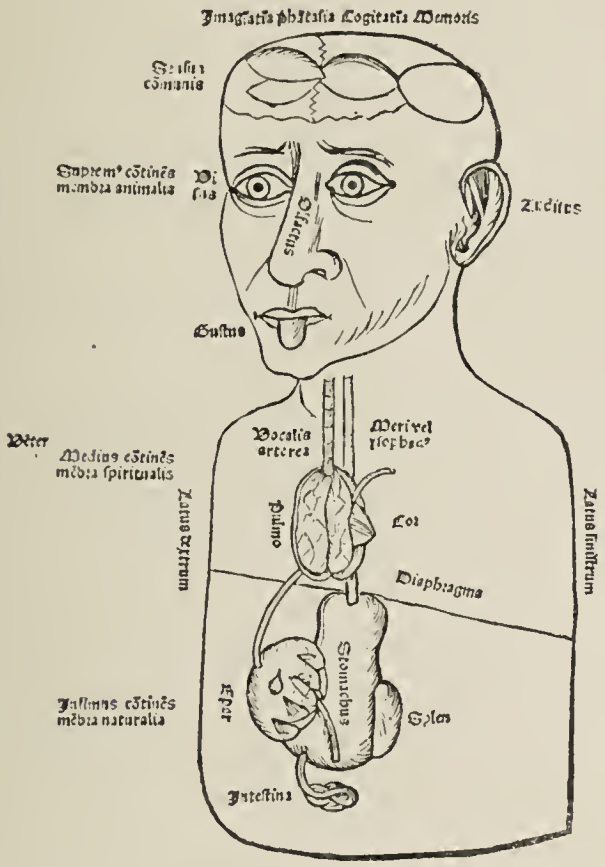


Fig. 4.—View of the Ventricles of the Brain. From the Philosophiæ naturalis compendium of Johannes Peyligk, 1499.

having torn through the thin roof of the fourth ventricle. Such a passage would be, as Galen says, quite ample and covered by thin membrane.

This view is amply supported by passages of Galen recently translated from the Arabic by Max Simon, as follows:

"The passage from the third to the fourth ventricle of which I have spoken goes between the two testes and has a peculiar cover like the capsule of the brain that unites all the arteries and veins. Over this cover is a portion of the brain resembling in shape a worm found in wood. It has accordingly been called by anatomists the vermiform process. . . . . Both ends of the passage that terminates in the posterior ventricle are covered by the vermiform process. When this is pushed backward it closes the passage, when moved forward it opens it. You may pass from the anterior to the posterior ventricle a round, smooth instrument whose calibre corresponds to the size of the opening of the passage. . . . . If nothing else is at hand use the blunt end of a writing pen." [13]

From this it would appear that the passage described by Galen was purely artificial. A communication between the third and fourth ventricles was, however, generally understood to exist, and we find it expressed or implied in Mundinus, Guy de Chauliac, Ketham, Peyligk and others. The ventricles were supposed to contain freely circulating "animal spirits," the *pneuma* of Galen, and the idea was common, traceable at least as far back as Poseidonius at the end of the fourth century, A. D., that imagination was located in the anterior ventricles, reason in the middle, memory in the posterior.

Some of the anatomists, however, evidently describe the real aqueduct.

Berengarius, in 1521, thirty-four years before the publication of the anatomical works of Jacobus Sylvius, says:

"In the posterior part of the middle [third] ventricle is a small foramen that leads to a deep vacuity . . . . situated between the

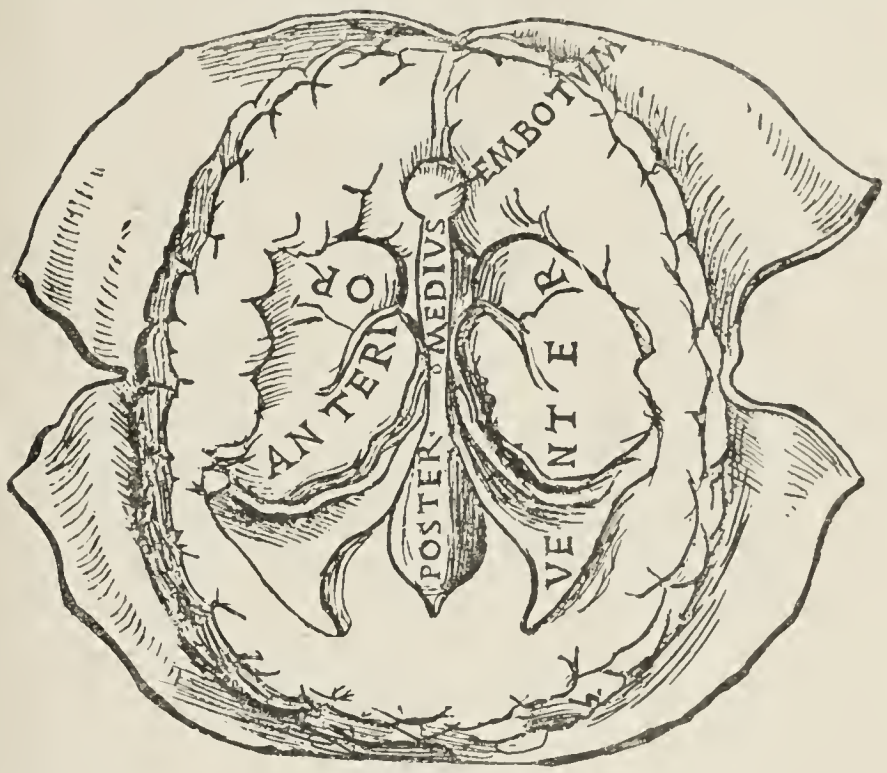


Fig. 5.—View of a Dissection of the Brain Showing a Passage from the Third into the Fourth Ventricle. From the Isagogæ breves of Berengarius Carpensis, 1523.

anterior and posterior parts of the brain and covered over with pia mater." [14] He has also a figure in which the aqueduct is clearly shown. See Fig. 5.

Vesalius, in 1543, clearly describes the passage and also depicts it in Figs. 7, 8 and 17 of the Fabrica. It is mentioned in several places, I will cite only the following, from p. 638:

"Behind and below this part [the testes and nates or corpora quadrigemina] is the anus-like orifice of the meatus that extends from the third to the fourth ventricle."

Servetus, who was burned at the stake by Calvin in 1553, was well aware of a communication between the ventricles.

[12] Œuvres de Galien, Vol. I, p. 566.

[13] Max Simon, Sieben Bücher Anatomie des Galens.

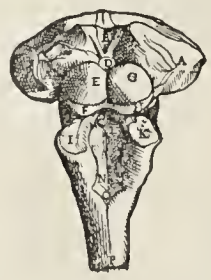
[14] Isagogæ breves in anatomiam humani corporis, p. 55a. A similar description is found in his Commentaria super Anatomia Mundini, 1521, p. ccccxlii, a.

Sprengel says that he made the aqueduct the seat of the soul. I find no confirmation of this in such transcriptions from the famous "Christianismi Restitutio" as I have been able to get. He appears to have adopted Galen's idea of the passage, calling the vermiform process "the janitor," which puzzles his commentator, Henri Tollin, very much.

Jacobus Sylvius's description in 1555 is as follows:

"From the third ventricle a long and narrow meatus, much larger in a living person, passes under the corpora quadrigemina into the fourth ventricle. . . . . The vermiform process is behind the corpora quadrigemina, and between their right and left sides is the meatus that runs from the middle ventricle to the last one. . . . . The vermiform process is a body composed of very many parts connected by delicate membranes, made up and jointed like a worm that feeds on old oak trees. It is borne upon the back of the corpora quadrigemina and held in place by bands on each side. It extends along the meatus that runs from the middle to the posterior ventricle and controls the animal spirits passing through the same."[15]

DECIMA SEPTIMI LIBRI FIGVRA.



DECIMAE FIGVRAE, EIVSDÉMQVE CHA-
racterum Index.

HAC figura eam cerebri portionem expreſsimus, quæ dorſalis medullæ educit initium: dein cerebellum à dorſalis medullæ hic conſpicua parte ademptum eſt, & cerebri teeſts, & nates, et glans pineæ nucis imaginem referens, ac poſtremò cauitas ea dorſalis medullæ quæ cum cerebel li cauitate quartum cerebri efformat uentriculum, hic pariter exprimuntur.

A, A Cerebri pars dorſalem producens medullam.

B Meatus ex tertio cerebri uentriculo in quartum ſub cerebri natibus tendens, cuius terminum ti

C. Quartum pertinentem uentriculum C inſignui.

FIG. 6.—View of a Dissection of the Fourth Ventricle of the Brain Showing at "B" and "C" the Upper and Lower Openings of the Aqueduct of Sylvius. Figure 10, Book VII, of the Fabrica of Vesalius, 1543.

Here we see an attempt to follow Galen while recognizing Vesalius's description. The passage is first *under* the corpora quadrigemina, then *between their sides*. It is "much larger in the living" (how could he know?), and the passage of the mythical spirit through it is controlled by the vermiform process. Sylvius must have known of Vesalius's description, as he certainly read the Fabrica from beginning to end, and it was published twelve years before his little work appeared.

Arantius, in Chap. VII of his Observationes Anatomicæ, published in 1587, is the first to call the passage an *aqueduct*. He says:

"At the bottom of the so-called third ventricle, under the conarium, in that part where are situated the corpuscles known as the glutia [corpora quadrigemina], anatomists place the beginning of a sinus which they compare to a pen used for writing [calamus scriptorius of fourth ventricle]. This, if we carefully consider, seems by no means worthy of being called a ventricle, because it is rather a canal or aqueduct which, descending from the centre of the cerebrum to the occiput, that is to say from the third ventricle to the cistern or sinus of the brain between the cerebellum and the already formed spinal cord, carries the perfected animal spirits."

Franciscus Sylvius, in his Disputationes (1663), has the following passage:

"From this third ventricle formed between the conjoined roots of the spinal cord [crura cerebri] there is a *canal* or *aqueduct* passing towards the fourth ventricle of the cerebellum under our bridge [pons Varolii] and the nates and testes [corpora quadrigemina] that are placed as four eminences at the extremity of the same."

This appears to be the source of the ascription of the aqueduct to Sylvius. Sir Michael Foster, who appears to be singularly unfortunate when dealing with the Sylvian structures, says:

"We owe to him [Franciscus Sylvius] it is true, and not to his older namesake, the aqueduct of Sylvius."

Both Morgagni and Haller have called attention to the impropriety of naming the conduit the aqueduct of Sylvius.[16]

It was certainly generally known to anatomists long before either Sylvius, and it does not even owe its name of aqueduct to them.

In the nomenclature adopted by the German anatomists it has been designated the *aqueductus cerebri,* and as this cannot do injustice to anyone, perhaps it had better prevail.

The truth seems to be that Franciscus Sylvius was so singularly fortunate in teaching the anatomy of the brain that any apt designation was naturally ascribed to him.

But why, it may be asked, have we so far forgotten what we owe to this acute investigator that almost every modern authority ascribes his discoveries to someone else? This is another curious incident in the history of anatomy and can only be explained by a short account of the man himself.

François de le Boë, usually known as Franciscus Sylvius, was born at Hanau, Germany, in 1614. His family was an illustrious one that had been driven out of France by the religious persecutions of that dreadful time. The form of the name, which, if pure French, would be Dubois, indicates a northern origin or perhaps contact with the Spanish settlements in the low countries. The youth was early remarkable for bodily grace, mental activity and docile, gentle character. There seems to have been plenty of money to spare for his education, as he took university courses at Sedan, Basle, Leyden and some of the German universities, finally receiving his doctor's cap at Basle when twenty-three years old. This wandering from one university to another was by no means uncommon in those days, when the publications of eminent men

[15] Isagogæ in Hippocratis et Galeni anatomicos Libros, Lib. III, Caps. XX, XXI.

[16] Morgagni (J. B.): Epistolæ Anatomicæ, p. 34.
Haller (Albrecht): Elementa Physiologiæ, Vol. IV, p. 67.

were not spread widely as at present, and the most effectual means of profiting by their knowledge was to actually attend their courses. Settling to practice first in Hanau, he soon left his native town, pursued some studies in Paris and then established himself at Amsterdam, where he became famous as a practitioner. His specialties were anatomy and chemistry, for which he had shown great love throughout the course of his studies. He was constantly dissecting and experimenting and it was at this time that he added the notes to the Institutiones Anatomicæ of Bartholinus, of which mention has been made.

In July, 1658, he was offered the chair of the practice of medicine at Leyden, then one of the first universities of Europe. He hesitated, doubting whether he possessed that universal knowledge and solidity of mind necessary for a teacher in a great university, but finally accepted and immediately obtained a great success. His clear, elegant and sometimes eloquent speech, slow enough to be followed by even somewhat dull intellects, drew around his chair an immense concourse of pupils who regarded him with strong affection. Students were attracted to him from the most distant parts of Europe, from Russia, Poland, Hungary, Germany, Denmark, Sweden, Switzerland, France and England. He was most indefatigable in his devotion to his work, carrying on at the same time anatomy, both normal and pathological, pathology, clinical medicine, chemistry and physics. He is said to have dissected more than 300 cadavers, and always performed autopsies, whenever practicable, in order to confirm his diagnoses. One of his biographers says that by the careful and assiduous attention he gave his pupils he formed a body comparable to the trained and picked warriors that emerged from the belly of the Trojan horse. It is a fact that most of the famous anatomists of that epoch were formed either directly or indirectly by his teaching. Among them were DeGraaf, to whom we owe our first correct conception of the anatomy of the ovaries; Nicolas Stensen, who first showed the muscular nature of the heart and uterus, and conceived that there must be conducting tracts in the brain; Swammerdam, who discovered both the red corpuscles of the blood and the valves of the lymphatics, and became famous through his profound researches into the anatomy of insects; Van Horne, who discovered the thoracic duct in man; Willis, not indeed a pupil but a disciple, who more accurately described the base of the brain and the cranial nerves.

According to Sylvius the foundations of medical science were anatomy, chemistry and clinical medicine. As was said by Lucas Schacht, his colleague, who delivered his funeral oration, he comprehended that it was indispensable to have a profound knowledge, not only of the structure of the human body, but of its reactions, of the container as well as of the contained.

It was to the brain that he especially directed attention. The use of hardening solutions was then unknown, and he invented a system of sections in various directions by which the structures could be more effectively displayed. He described more accurately the interior of the ventricles and the sinuses of the dura mater. He did not confine himself to cerebral structures, but examined with care the lymphatics, the salivary glands, the pancreas and the spleen which were then exciting great attention from the discoveries of Pecquet, Rudbeck, Needham and others. Malpighi had not yet written, and the nature of glands had not yet been made clear by the microscope, yet Sylvius clearly pointed out the differences between acinous and ductless glands, naming the former conglomerate, the latter conglobate, appellations sometimes heard to-day.

In physiology he was also active. Harvey had put forth his treatise on the circulation of the blood only a few years before. In spite of the bigoted opposition of nearly all the older anatomists of Europe, Sylvius warmly espoused this doctrine, made it the basis of his teaching and brought forward new evidence of its truth; especially describing the action of the diaphragm which, before him, was not clearly understood. He called attention to the probable modification of the blood by the ductless glands, specifying the spleen, the thyroid, the thymus and the suprarenal capsules, and even suggesting that the liver might have a duplicate function and, besides secreting the bile, effect some important changes in the blood carried from it by the ascending vena cava. His insistence upon the functions of the spleen was so great that his adversaries derisively dubbed him *patronus lienis,* the keeper of the spleen, an appellation which he accepted with enthusiasm, saying that he wished no better title of honor than that of the discoverer of the function of that important and little-understood viscus. He anticipated our modern ideas in æsthesiology by distinguishing between the thermal and tactile senses. He was aware of the difference between arterial and venous blood and ascribed the color of the former to mixture with respired air. He appears to have understood the analogy between the processes of combustion and respiration.

In pathology, too, he attained distinction. He seems to have understood something of purulent infection, as he speaks of the return into the system of altered and corrupted blood. Also of the effect of insufficient excretion of urine; noticed the occurrence of tubercles in pulmonary phthisis, and advised listening to the bronchial sounds for the purpose of ascertaining the condition of the air tubes.

He was among the very first to permanently establish bedside instruction as a regular part of the medical curriculum. Something of the kind is rumored to have been done in classical times, and for a short period at the universities of Bologna and Padua, but it is really at the university of Leyden, where there was a small infirmary with only twelve beds, that Sylvius firmly established this instruction which he mentions as follows in his Epistola Apologetica, written in 1664:

"Called some five years ago and more to the chair of medicine, I at length assumed it, and have endeavored with all my might to make sure that my auditors should profit as much as possible by my industry and labor and go out as excellent physicians. To this end I pursued not only those things that it was truly necessary for them to investigate and find out, I went further in my way of teaching them, using especially a method not hitherto in use here nor perhaps elsewhere. I led them by the very hand into the practice of medicine, i. e., I took them daily into the public hospital for the purpose of seeing the sick to whose complaints and other notable symptoms I directed attention, asking immediately afterwards what they had observed in the disorders of the patient; their views as to the causes and proper treatment and their reasons for the same. Whenever differences of opinion arose among them concerning these things, I, in a quiet way, pitted against each other those holding different opinions, in order that they might mutually satisfy themselves by as solid reasons as possible drawn from every source, finally giving my own judgment regarding the various views. With me they confirmed the happy results of the treatment, when God rewarded our labors by the return to health of the patients, or assisted in the examination of the cadavers when the patients finally paid the inevitable tribute to death."

His colleague, Lucas Schacht, describes his method of instruction as follows:

"When he came with his pupils to the patient and began to teach, he appeared completely in the dark as to the causes or the nature of the affection the patient was suffering from, and at first expressed no opinion upon the case; he then began by questions put to different members of his audience to fish out [expiscabatur] everything and finally united the facts discovered in this manner into a complete picture of the disease in such a way that the students received the impression that they had themselves made the diagnosis and not learnt it from him."

I think that it must now be apparent that we have in Franciscus Sylvius one of the great original thinkers of the seventeenth century; of the period that produced Harvey, Descartes, Leibnitz and Malpighi; a mind eager to obtain new facts and to theorize regarding them. In order to understand what he did in the field of therapeutics it will be necessary to consider briefly the state of the science at that time.

There had been several efforts to arrive at a rational theory of medicine. The Galenical remedies then in vogue were for the most part fanciful attempts to find qualities that might either agree or disagree with the disease, and the prescriptions were of the most portentous character, not infrequently containing scores of ingredients. Chemistry, as we now understand it, was unknown, chemical affinity was but dimly comprehended and the chemical elements not yet conceived. The old idea, traceable back to Empedocles, that the universe is formed of four elements, earth, air, fire and water, was still prevalent. Observation of chemical phenomena had merely led to alchemy, vain attempts at the transmutation of metals and the search for the elixir of life. Physiological processes were considered to be too mysterious to be fathomed, and under the control of mythical forces not existing outside of the body.

Paracelsus, coarse, blustering and arrogant, gave a rude shock to this Galenical tradition. He cried out:

"Away with these false disciples who hold that this divine science [alchemy], which they dishonor and prostitute, has no other end than that of making gold and silver! True alchemy has but one aim and object, to extract the quintessence of things, and to prepare arcana, tinctures and elixirs which may restore to man the health and soundness he has lost."

It was with trumpet blasts like this that the modern science of chemistry was ushered in.

It should be remembered that most of the fulminations of Paracelsus occurred at Basle, where he was a professor, and where he publicly burned the books of Galen and Avicenna in 1527, and that Sylvius took his final course of study there. It is certainly reasonable to suppose that the traditions concerning that strange enthusiast may have profoundly influenced the young man.

Van Helmont followed Paracelsus and adopted in great measure his doctrines. Like him, he conceived that the processes of the body were presided over by a vital entity called an *archæus*. He introduced into chemistry the idea of gases, in fact coined the word which we now use. This led him to consider that the active principle by which the archæus worked was a *ferment*, the chief agent in digestion. He also taught what was known as "The Great Secret"; that there is an energy in everyone capable of affecting other objects through the suggestion and power of the imagination. It is not difficult to parallel this philosophy with that professed by some at the present day.

Sylvius was fully acquainted with the philosophical speculations of his time. His inaugural discourse on assuming the chair at Leyden was an attack on the doctrine of innate ideas. He was a much better anatomist than either Paracelsus or Van Helmont, and declared that no one can know the causes of the lesions of functions who does not understand the parts through which those functions act. Rejecting the *archæus*, he held that the physiological phenomena of the body are wholly chemical. The ferments of Van Helmont he considered to be chemical substances contained in the various digestive juices, especially in the saliva, the pancreatic juice and the bile. Their combination produced an *effervescence* which played a great part, both in the digestion of the food and in the final production of animal spirits in the brain. These spirits, transmitted by the nerves, produced sensation and motion, stored in the brain were the source of imagination and reason.

When reading the early writers in any science we are liable to be misled by their use of terms. While the names they employ seem fantastic and strange, because our point of view

has changed, we often find, if we examine closely and translate their language into modern scientific speech, that the difference is not so very great. We no longer speak of "animal spirits" formed in the brain and distributed by the nerves, but we do consider the brain as a power-house wherein resides a force capable of effecting changes in the nerves transmissible to remote parts of the body.

It was upon this theory, here sketched only in brief outline, that his system of therapeutics was based. Excess of acid or of alkali in the digestive juices produced corresponding "acridities" which were to be overcome by medication which he looked upon as applied chemistry. He used many remedies internally that others rejected because of deleterious effects—mercury, nitrate of silver, sulphate of zinc, etc.—and was particularly enthusiastic about antimony.

It is easy for us to see, in the light of the twentieth century, that his scheme was far too simple, that he had no idea of the complexity of vital phenomena nor of the chemical constitution or therapeutic value of the drugs that he employed. Yet we must confess that his "New Idea in Medicine," as he called it, was of great value and is bearing fruit with us to-day. At present, with improved apparatus in every field, we are earnestly striving to ascertain the chemical reactions occurring in the living body so as to base upon them a rational system of therapeutics. Sylvius did the same.



Fig. 7.—Portrait of Franciscus De Le Boe Sylvius.

His system had a great vogue and secured many adherents throughout Europe. In fact it obtained such renown that by it Franciscus Sylvius is generally known. His attainments as an anatomist, a physiologist, a clinician are forgotten, but as the founder of an obsolete system he is casually mentioned on a subordinate page of history. That system, like all founded on imperfect knowledge, was doomed to failure. It lasted out its day, was superseded by other plausible theories or by the wise "expectant treatment" of Sydenham, and when it passed Sylvius too suffered an eclipse. While the fame of Vesalius caused many discoveries to be improperly assigned to his preceptor, the elder Sylvius, the younger man was discredited because his system of therapeutics was deemed unsound.

It was said by his opponents that the system killed more men than perished in the Thirty Years' War. This is, of course, a gross exaggeration, but no doubt his theories did great harm in the hands of ignorant sciolists. Sylvius, himself, had a great and probably deserved reputation as a practitioner. Like many other founders of systems, he doubtless practiced better than he preached.

In person, Sylvius is described as remarkably handsome, tall and commanding, with regular features. He had a sweet and amicable disposition which made him many friends that he always kept. In scientific discussion he was never caustic nor offensive. He was adored by the poor whom he often treated gratis, giving them medicines that he, himself, prepared.

He was twice married, his second wife and only child died in an epidemic of relapsing fever in 1668, a disease to which he also nearly succumbed in the following year. The political troubles of his country made the year 1672 a very trying one for him, and when in that year he was again seized with a fever he said to his friend, Lucas Schacht: "I know as well as you the gravity of this disorder. I escaped three years ago; this time I shall die." His prediction was fulfilled, for he ceased to live November 14, 1672.

It is a sign of the deep and serious nature of the man that he had anticipated this event by erecting, seven years before, in the choir of St. Peter's Church, in Leyden, a tomb upon which was inscribed the following:

FRANCISCUS DELEBOE SYLVIUS,
MEDICINAE PRACTICAE PROFESSOR,
TAM HUMANAE FRAGILITATIS
QUAM OBREPENTIS PLERISQUE MORTIS MEMOR,
DE COMPARANDO TRANQUILLO INSTANTI CADAVERI
SEPULCHRO
AC DE CONSTITUENDA RUENTI CORPORE DOMO
AEQUE COGITABAT SERIO.
LUGDUNI BATAVORUM,
MDCXLV.

Franciscus de le Boe Sylvius,
Professor of the Practice of Medicine,
mindful of human infirmity
and of the often stealthy approach of death,
bethought him to prepare against that time
a quiet sepulchre for his remains,
a house for his mortal body.
At Leyden,
1665.

THE EPIDEMIC OF THE INDIANS OF NEW ENGLAND, 1616-1620,* WITH REMARKS ON NATIVE AMERICAN INFECTIONS.

By Herbert U. Williams, M. D., Buffalo, N. Y.

There is no more burning problem for solution by anthropologists than the discovery of the origin of the great races of Europe, Asia, Africa and America as we find them to-day. Using the word race in a broad sense, as one speaks of a white or a negro race, there seems to have been a single American race (excluding the Eskimo).[1]

Our North American Indians, the Aztecs of Mexico, the Mayas of Central America, the Peruvians, the savages of South America clear to Patagonia and Tierra del Fuego belonged to it alike. Whence this American race came no one can say. Perhaps man originated in America. More probably the American race came in the first place from Asia. At all events, the red men became a separate stock a very long time ago. They lived practically apart from the rest of mankind until 1492. They were as characteristic a product of American soil as the possum or the rattlesnake, as corn or tobacco. While in the old world governments and cultures developed, flourished and fell into decay, the American race was painfully working its way towards the beginnings of a civilization. John Fiske says: "There is something solemn and impressive in the spectacle of human life thus going on for countless ages in the eastern and western halves of our planet, each all unknown to the other and uninfluenced by it." There is no evidence to show that the hardy Vikings, who reached this continent before the time of Columbus, made any mark upon it. And if Chinese, Japanese or Polynesian adventurers were ever blown across the Pacific to America, it has not been proved, and they have left no traces that can be recognized definitely. Nor need we be much concerned with the colony of Northmen that long lingered in Greenland, for their contact with the rest of America through the medium of the Eskimo was probably very slight.

From this point of view it is of interest to study the relation of the American race to infectious diseases. Any communicable disease occurring at the time of the discovery of America on either the eastern or the western continent exclusively probably originated on that continent. Any communicable disease belonging at that date equally to both halves of the world may probably be referred to a time at least as remote as that when the American race separated from the rest of mankind.

Speculations as to the manner in which the great infections arose are mostly futile. Doubtless the species of bacteria or other organisms that now produce disease evolved from some of the swarming thousands of harmless kinds. Further than this we cannot say. However, we may possibly learn something from history of the time and place at which the transformation happened. It would be the study of a lifetime for any single man to investigate the histories of the various infections. The subject is one of immense difficulty, for the records of ancient writers leave the early histories of most of them in great doubt. However, such superficial examination of the literature as it has been possible to make points to the very curious conclusion that, as far as is known, the American race developed almost no peculiarly American infections. Many times new epidemic diseases from Europe have spread over America and have been very fatal to the Indians, but the reverse seems not to have been recorded if it ever happened, unless yellow fever and syphilis may be exceptions.

The Origin of the Great Infectious Maladies.

It has been impossible for the present writer to do more than to examine a few of the standard text-books (especially Hirsch),[2] but from them one learns that certain facts in the history of the infections seem fairly well established.

(1) Small-pox, cholera, leprosy, bubonic plague, mumps, glanders, anthrax and rabies are diseases of great antiquity, and all seem to have arisen in the old world. Small-pox has been known in eastern Asia from an early period; it first came to America with the Spaniards, and made fearful ravages among the Indians. The birthplace of cholera was probably the delta of the Ganges in India, whence it extended over the rest of the world, including the western continent, within quite recent years. Leprosy has been known in both Asia and Africa since ancient times; the crusades helped to spread it through Europe; it was conveyed to America by both African negroes and European whites. Bubonic plague also probably originated in the Orient and seems to have been unknown on the American continent till recently. Glanders was described in Europe in the fourth and fifth centuries. It is likely that anthrax had a similar history, and it may be placed under this heading provisionally. Rabies was known in Europe long ago; it was described by Aristotle. It is said to have appeared first in America, near Boston, in 1768. But as dogs were used widely

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* Read before the Johns Hopkins Hospital Historical Club, January, 1909.

[1] When the material collected by the Jessup expedition has been fully worked out, it may become necessary to modify these statements slightly. It is already alleged that a few tribes of northeastern Siberia may properly be classed with the American race, while they differ from other Asiatics. (Boas, Proceedings International Congress of Americanists, Thirteenth Session, New York, 1902, page 91; also American Museum Journal, Vol. 3, page 115.) It does not follow that the American race came from Asia, although these conclusions from the Jessup expedition make a powerful argument for such a theory. In any case, the position taken in the present paper concerning the effect of the isolation of the American race upon the development of communicable diseases would not be influenced greatly. See also the recent paper by Dr. W. H. Holmes, Chief of the Bureau of American Ethnology (Smithsonian Institution), on The Peopling of America.

[2] Hirsch, Historical and Geographical Pathology.

by the Eskimos and the Indians, the possible occurrence of rabies from native sources should be borne in mind.[3] In connection with the above group, the sleeping sickness and other trypanosome infections described for the African continent may also be considered provisionally.

(2) With regard to another group of infections, history is less definite, though it is not sharply separated from the preceding group. It includes tuberculosis, diphtheria, influenza, gonorrhœa, beriberi and malaria. While all of them appear to have been described in Europe before the discovery of America, and some of them, like tuberculosis, in the earliest medical writings, they were not clearly differentiated till quite recently. The manner in which they spread over the world is, therefore, mostly a matter of conjecture. The writer has met with no allusion to their having been observed among the aborigines of America by early explorers, but cannot claim to have examined the evidence even superficially as yet. Tuberculosis, in particular, is so widely spread among the lower animals (occurring in cold-blooded animals and birds as well as in mammals) that it may well have been one of the most ancient infections in man and common to several races of the human species. On the other hand, many writers have remarked upon its ravages among the Indians since the arrival of white men.[4] Malaria was undoubtedly known to the ancients in the old world, but it will probably be impossible to determine whether or not it occurred in America before the time of Columbus. As its parasite has so complicated a developmental cycle, and as analogous hematozoa are found in birds and in cold-blooded animals, we may presume that it is a very ancient disease. For this reason, it may have been widely spread among the races of man from their earliest beginnings. Manson has recently suggested an explanation for the division of the cycle of the malarial parasite between man and the mosquito, in which he assumes that the common ancestor of man and the mosquito was the original host of the ancestor of the malarial parasite. This theory would carry the origin of malaria back to the earlier geological periods through an interval of practically unthinkable millions of years.[5]

(3) A third group of infections may be made of typhoid, typhus and relapsing fevers, measles, German measles, scarlet fever, chicken-pox, whooping cough, chancroid, Malta fever and dengue. All of these have been differentiated since the discovery of America, and most of them very recently. While all of them are probably ancient, and some of them appear to have been described long ago, the descriptions are not definite. Another might be added to this list in dysentery, the causation of which is still very imperfectly understood.

It is possible that some of the diseases in this group originated in America and were conveyed to Europe. If that is the case, the fact seems to have been overlooked at the time when it may have happened.

(4) The infections of the pyogenic group (including pneumonia, meningitis, erysipelas and tetanus) have been left out of consideration on account of the peculiar difficulties that their present widespread occurrence offers. The parasitic higher fungi and worms have not been included, as the problem is intricate enough without having them to reckon with.

(5) This leaves two important infections that some writers believe to have originated on the American continent, viz., syphilis and yellow fever. The present paper is not the place in which to discuss the merits of these questions. Personally, the present writer has been unable to form an opinion in either case, and regards the evidence on both sides as not convincing. In the Rocky Mountain region of Wyoming, Montana and Idaho the disease called spotted or tick fever is known, which is probably due to some undiscovered infectious agent. It resembles typhus fever in many respects. If it is a new specific disease, it is very likely of American origin. It has been alleged that this disease used to occur among the Indians, but that seems to be quite doubtful. The milk fever of the middle-western and southern United States, the skin disease of Mexico called "pinta" and Peruvian wart (verruga or Carrion's disease), while very probably native to America, are, like the Rocky Mountain spotted fever, confined to a comparatively limited area. Yellow fever and syphilis are the only diseases in this group entitled to rank among the great infectious maladies of the world. If infections peculiar to America have ever arisen and wholly disappeared again in prehistoric times, we have no means of knowing it.

Social Conditions of the American Race.

The conditions of life among the American tribes might be expected to have important bearings on the evolution and spread of infections. There were few large communities, and there were no great states with stable governments, hardly excepting even Mexico and Peru. The development of commercial intercourse and travel was not to be compared with their development in the old world. The American race had no domestic animal but the dog, except that in Peru the llama was used to some extent.[6] The lack of a domestic animal was a powerful factor in the slow growth of culture among American tribes. That this lack may also have been an important factor in making infections less frequent seems plausible when we recall the relation of the horse to glanders, the sheep to anthrax, the cow to tuberculosis and the goat to Malta fever. The common house rat, which is a native of the old world,

[3] V. A. Moore, Infectious Diseases of Animals, Ithaca, 1902, p. 307.

[4] Dr. Hrdlicka, of the United States National Museum, spent much time among the Indians of the southwestern States and northern Mexico, where the natives have been comparatively little influenced by contact with white men and still live much as their ancestors did. He found pulmonary diseases, apparently pneumonia and bronchitis (?) very common; but while he reported that tuberculosis was frequent and very fatal among certain tribes, he was of the impression that it had been communicated to the Indians by white men. (Washington Medical Annals, Vol. IV, No. 6.)

[5] Manson, The Lancet, Oct. 3, 1908.

[6] The guinea-pig, the turkey and the duck might perhaps be added.

may almost be counted as a domestic animal and is of prime importance in connection with bubonic plague. Even the bed-bug, which, if not a domestic animal, has been the inseparable companion of man in the old world, cannot be overlooked as a carrier of germs (alleged for relapsing fever); and it probably came to America with the white man. The conditions of existence for the American race were greatly ameliorated by the use of maize or Indian corn, which yielded a rich harvest, even to a very crude kind of agriculture. With a poet's fine appreciation of great essential truths, Longfellow well used Indian corn as the prize that Hiawatha won for his people by his wrestling contest. However, most of the Indians were improvident: their provision of corn, if they raised it, was often insufficient, their food supplies of fish and game were precarious. They lived very largely in the open air; they suffered greatly at times from cold, wet and severe physical strain. Although they were acquainted with tobacco, their use of alcohol was not to be compared in extent with the practice of the old world. Many tribes were cannibals.

Some of the conditions of life enumerated seem to have important bearings on the development of infectious diseases, or rather the lack of them, and it is suggestive to compare them with the conditions of society that probably prevailed in China, Hindustan and Egypt at the time when the infections, the history of which is best known, were first described by ancient writers.

Rarity of Native American Infections.

The brief synopsis that has been made shows that our knowledge of the origin of the infectious diseases is extremely imperfect. But, such as it is, it indicates that the American race during its sojourn of some thousands of years apart from the rest of mankind developed a surprisingly small number of infections peculiar to it. In this respect the western continent offers a singular contrast to the eastern. Although more complete study of the subject may show what has been stated of certain particular infections to be incorrect, it does not seem likely to disprove the main principle.

Need for Study of Early Epidemics.

The ideas that have been advanced above have been suggested by reading done at odd times without any very definite purpose. They are advanced, tentatively and with much hesitation, only because the writer appreciates the hopelessness of attempting thorough, systematic study of this enormous field. One fact, however, has become perfectly clear: that such materials as history and tradition have left bearing on disease among the Indian tribes in the early days need to be collected and studied. That is particularly true of epidemics, for history and tradition assert that the Indians have also suffered from epidemics.

The Great Pestilence of the Indians of New England, 1616-1620.

These considerations have led the writer to undertake the study of the pestilence that occurred among the Indians of New England about 1616 to 1620. Its effects were so terrible that the Puritans found the country almost depopulated; it made such an impression that stories of this epidemic seem to have become fireside legends during the early days of the colonies. For we meet with allusions to it repeatedly in the quaintly worded records of the period. The Puritans were fond of speaking in scriptural language and of drawing parallels between their own case and that of the Children of Israel. In their books and tracts we often find the epidemic regarded as the method by which Providence removed the savages to make room for Englishmen in general and for Puritans in particular. There seems to be no doubt that the settlement of New England was rendered a much simpler affair than it otherwise would have been by reason of the absence of any considerable Indian population along the coast. In the case of the Pilgrims at Plymouth, the very existence of their colony in its early days depended on that circumstance. Histories are apt to pay scant attention to disease, although its results often reach farther than those of war. But nearly every history that treats of the New England colonies tells of this epidemic. It has been discussed by Noah Webster in his Brief History of Epidemic and Pestilential Diseases (Vol. I, p, 281); by Dr. Oliver Wendell Holmes in a Lowell Institute lecture given in 1869; by Dr. Samuel A. Green in his essay on the History of Medicine in Massachusetts, 1881; and by Mr. Charles Francis Adams, both in editing the Prince Society's edition of Morton's New English Canaan, and, at considerable length, in his Three Episodes of Massachusetts History (Boston, 1892): but the present writer cannot find that it has by itself ever been the subject of separate and special inquiry. To discover what may be learned of its nature and its source will be the purpose of this paper.

First, however, it is necessary to examine the history of the New England coast during the period just preceding its colonization. That period is merely one episode in the wonderful story of the conquest of the western continent. In the letters of tough old sea captains and in the tales of adventurous fur-traders of the seventeenth century, one learns to know stern, brave and sometimes cruel men; for their spiritual great-grandsons you must look to-day on the banks of Newfoundland or in the far northwest.

Early History.

Although the coast of New England had been visited by some of the earliest discoverers, it was not until about the year 1600 that the region was at all thoroughly explored. The first part of the seventeenth century was in fact the time when the settlement of eastern North America in general was seriously undertaken. The beginning of Nova Scotia dates from 1604, of Jamestown from 1607, of Quebec from 1608, of New York from 1614. During these years, the shores of Maine and Massachusetts were visited by some of those rare sailors whose names are familiar to every school boy: Champlain, Henry Hudson, Bartholomew Gosnold, that incomparable prince of adventurers, Captain John Smith, and many others. In 1606, two English companies were formed, the

Plymouth or North Virginia Company and the London or Virginia Company, for the exploiting of the northern and southern parts of the coast respectively. The English had cherished nearly a century-full of luscious dreams of picking up such treasures in the northern part of America as the Spaniards had found in Mexico and Peru. But they were beginning to realize that these had been dreams indeed, and at last the honest resources of the country were to be developed in a business-like fashion. That desirable result was not, however, achieved immediately.

In 1607, the Plymouth Company sent a considerable party to found a settlement at the mouth of the Kennebec River in Maine. They took with them an Indian who had been brought to England earlier by Captain Weymouth.[7] But the settlers returned discouraged after experiencing a single one of the sharp and unwelcome winters that often visit those latitudes. They have since been known as the Popham colony.

The New England coast was sought during this period not only for purposes of exploration and colonization, but by numerous traders and fishermen who had already been frequenting the Banks of Newfoundland for a century. The English fishermen used as a kind of headquarters the island of Monhegan, which is about half way between Portland and Mount Desert. But the Dutch, the French and the Basques came thither as well. When Bartholomew Gosnold visited the shores of New England in 1602, he found evidences that Basque fishermen had been before him.[8] Sir Ferdinando Gorges[9] complained of the loose character of the roving traders during his time, that they taught the Indians to drink themselves drunk, and debauched their women. In this picture of three hundred years ago, we can already discern the prototype of the futile and alcoholic Indian brave of our modern reservations. What is important for our purposes is the evident fact that there were ample opportunities for the interchange of infections between the traders and the natives.

The Indian Tribes of the New England Coast.

The descriptions of the New England coast which the explorers have left show that they found it occupied by thriving Indian communities. But when we remember that the powerful Iroquois Five Nations of New York State numbered only sixteen thousand persons, it is evident that the Indian population between the Penobscot River and Cape Cod was after all only a matter of a few thousands. The Indians were of the Algonquin family, belonging to several different tribes, whose exact limits it is neither easy nor very important for us to determine. Approximately, the principal tribes along the coast from north to south were (according to Palfrey's classification, founded apparently on Gookin), as follows:

Abnakis or Tarratines, in Maine, west of the Penobscot River.

Pennacooks or Pawtuckets, in New Hampshire.

Massachusetts, about Massachusetts Bay.

Wampanoags or Pokanokets, about Plymouth and Cape Cod.

Narragansetts and Pequots to the west, in Rhode Island and Connecticut.

Their habits of life differed from those of the other Indians of eastern North America in no important particular. Their settlements were sometimes surrounded by stockades, which is evidence that they were not in the main a roving people. Their houses were wretched wigwams covered with bark or mats, crowded, evil-smelling and thick with smoke. Their scanty clothing consisted of skins. Their personal habits were filthy. Fleas and lice abounded within their wigwams.[10] In the summer time mosquitoes were omnipresent, and the early descriptions pay tributes to the pugnacity of these insects in terms of emphatic disapproval. As was the case with most of the Indians in the temperate parts of North America, while the men were at times active hunters, their living depended mainly upon agriculture. Corn (maize) was their mainstay, although they raised also beans, squashes and pumpkins. Fish and shellfish were abundant and formed a very important part of their food. It is not entirely accident that corn and beans, pumpkins and codfish are still held in such honorable esteem by New Englanders. The Indian women here as elsewhere did the drudgery and much of the hard work.

On numerous occasions small parties of Indians were kidnapped from New England by sailors and carried to Europe, where they were regarded with singular interest. This abominable practice began with the first voyage of Columbus. Evidently Shakespeare was familiar with it. "When they will not give a doit to relieve a lame beggar, they will lay out ten to see a dead Indian." (Tempest, Act II, Scene 2.) Certainly live Indians were shown in London as wonders. Several Indians from New England who had been taken to Europe are known to have been brought back subsequently. One such case has already been mentioned, in connection with the Popham colony (1607), and the same happened on a ship in the year 1614, shortly before the outbreak of the great epidemic among the Indians.[11] The bearing of this fact on the possible importation of a communicable disease from Europe to the Indians in New England is obvious.

At the time of Captain John Smith's expedition to New England in 1614, a ship commanded by one Hunt was left to make the return voyage by way of Spain. On his own account, this scoundrel Hunt captured between twenty and thirty Indians near the place where Plymouth was founded six years later. He carried the Indians to Spain and sold some of them

[7] Strachey, History of Travel into Virginia, Mass. Hist. Soc. Coll., Series 4, Vol. I.

[8] See various original documents on Gosnold's voyage, in Mass. Hist. Soc. Coll., Series 3, Vol. VIII.

[9] See Gorges, Briefe Narration, etc., Mass. Hist. Soc. Coll., Series 3, Vol. VI, p. 70.

[10] The bed-bug seems to have been introduced from Europe. See U. S. Dept. of Agriculture. Bureau of Entomology, Circular No. 47, quoting Kalm; also Josselyn, Two Voyages to New England, Mass. Hist. Soc. Coll., Series 3, Vol. III, p. 289.

[11] Captain Hobson, who had the Indians Manawet and Epenow. Manawet died shortly after the ship arrived; Epenow escaped to the shore, and thereafter nursed a very natural hatred for the English, which he finally visited on Captain Dermer, a good friend to the Indians. See below. See also A Brief Relation, etc., of New England, Mass. Hist. Soc. Coll., Series 2, Vol. IX, p. 1.

as slaves. But one at least made his way back to America, and took part in the explorations by Captain Dermer, who will be referred to hereafter. This good fellow, usually called Squanto (or Tisquantum), was destined to be of great service to the Pilgrims at Plymouth. He became so attached to his English friends that he is said to have bequeathed to them his poor little treasures and to have begged them to pray that he might go to their heaven when he died. As for Hunt, one is tempted to hope that his spirit may somewhere, probably not in heaven, be conscious that his name is execrated by all writers that mention him, from worthy John Smith to those of the present day.

As far as the present writer has been able to discover, although Smith and several others were on the coast of New England in 1614, and one or more vessels in 1615 and in the summer of 1616, they have left no account of any unusual sickness.

History of the Great Epidemic.

The first report of an epidemic among the Indians seems to have been brought back by an expedition sent to the coast of Maine by Sir Ferdinando Gorges. Students of colonial history believe the date to have been 1616-1617, and the locality where the English wintered the banks of the Saco River. Gorges, who was governor of Plymouth in England, was a man of much energy, though there was a blot on his escutcheon, which has nothing to do with our subject. He was the leading spirit of the Plymouth Company, which is not to be confused with the Plymouth colony later established in New England by the party of settlers called the Pilgrims. Gorges was active in attempts to interest others in developing the resources of his company's concession. His references to the epidemic are so brief that they may be quoted.[12]

This narrative of Gorges was written when he was an old man, many years after the events referred to happened. It is not improbable that his agent, Richard Vines, kept a journal and made a written report. The writer has been unable to learn of the existence of such documents. Palfrey states that Gorges had an immense quantity of papers relating to New England, which have disappeared. As Vines is said to have been a physician, his account of the epidemic would have the highest value. It seems to the present writer not certain that any Europeans, except his party, personally observed the disease. Vines was evidently a man of ability, for later on he held high positions under Gorges in the early days of the Maine colony. All good lovers of the mountains will be interested to recall that Vines was one of the leaders of the first party of white men to visit the summit of Mt. Washington. In 1645 he went to England and from there to Barbadoes where he died.

The epidemic is mentioned next in a letter of Captain Thomas Dermer, who had already been on a voyage with Smith as well as at Newfoundland. This Dermer seems to have been a brave and determined man and a fine fellow. Governor Bradford speaks somewhat slightingly of him, but one may suspect that the stern old Calvinist was prejudiced against all agents of the aristocrats in England. Dermer went in one of two ships sent by the company. He missed the other ship, left his own vessel at Monhegan, and embarked on the daring enterprise of exploring the coast in a small boat. The Indian Squanto, who had been taken to Europe by Hunt five years before, was one of the little party. Dermer's brief story[13] of what he saw of disease among the Indians is preserved in a letter as follows:

To his Worshipfull Friend M. Samuel Purchas, Preacher of the Word, at the Church a little within Ludgate, London.

Sir: It was the nineteenth of May, before I was fitted for my discovery, when from Monahiggan I set sayle in an open Pinnace of five tun, for the Iland I told you of. I passed alongst the Coast where I found some antient Plantations, not long since populous now utterly void; in other places a remnant remaines, but not free of sicknesse. Their disease the Plague, for wee might perceive the sores of some that had escaped, who described the spots of such as usually die. When I arrived at my savage's native Country (finding all dead) I travelled alongst a daies journey Westward, to a place called Nummastaquyt (now Middleboro), where finding inhabitants, I despatched a Messenger a dayes journey further West, to Poconaokit, which bordereth on the sea; whence came to see me two Kings, attended with a guard of fiftie armed men, who being well satisfied with that my Savage and I discoursed unto them (being desirous of noveltie) gave mee content in whatsoever I demanded, where I found that former relations were true. Here I redeemed a Frenchman, and afterwards another at Matachusit, who three yeeres since escaped shipwracke at the northeast of Cape Cod.

The date in the margin is 1619.

The plucky Dermer finally reached Virginia. But that rare spirit which animates the born explorer drove him back to the wild and dangerous coast of New England, where, in the course of the year, he was terribly wounded in an encounter with the savages[14] on the island of Martha's Vineyard. He made his

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[12] Gorges, Briefe Narration, etc., Mass. Hist. Soc. Coll., Series 3, Vol. VI, p. 57.

Finding I could no longer be seconded by others, I became an owner of a ship myself, fit for that employment, and under color of fishing and trade, I got a master and company for her, to which I sent Vines and others my own servants with their provision for trade and discovery, appointing them to leave the ship and ship's company for to follow their business in the usual place (for I knew they would not be drawn to seek by any means). By these and the help of the natives formerly sent over, I came to be truly informed of so much as gave me assurance that in time I should want no undertakers, though as yet I was forced to hire men to stay there the winter quarters at extreme rates, and not without danger, for that the war had consumed the Bashaba and the most of the great sagamores, with such men of action as followed them, and those that remained were sore afflicted with the plague, so that the country was in a manner left void of inhabitants. Notwithstanding, Vines and the rest with him that lay in the cabins with those people that died, some more, some less mightily (blessed be God for it), not one of them ever felt their heads to ache while they stayed there.

[13] Purchas's Pilgrims, Vol. IV, 1778. Edition of Hakluyt Society, Vol. XIX.

[14] The Indian Epenow, mentioned above, seems to have been the leading spirit of the attacking party.

way to Virginia a second time, where he died, some say of his wounds and some of the diseases prevalent in that colony.

The Pilgrims.

Late in 1620, and a few months after Dermer had left those parts, the ship Mayflower landed at Plymouth. The colonists [15] had planned to go to Virginia, but now changed their resolution and remained where they found themselves. Our next news of the epidemic among the Indians occurs in the relation of the progress of the settlement written probably by Winslow and Bradford. It is a homely narrative, having in its earlier parts nothing to tell of but the cruel sufferings of these devoted people. Their splendid courage, their sublime patience are beyond all praise from us. Out of one hundred and one persons, fifty-one died during the first year, apparently from exposure, insufficient food and scurvy. In the course of their explorations made in that winter they found an iron kettle and other indications that Europeans had been in the country before them. About the middle of March an Indian named Samoset visited them. He had learned some English from fishermen at Monhegan, and greeted them with the word "welcome."

To continue with a quotation from the relation: [16]

He told us that the place where we now live is called Patuxet, and that about four years ago all the inhabitants died of an extraordinary plague, and there is neither man, woman, nor child remaining, as indeed we have found none.

A few days later the Indian Squanto, already referred to, appeared on the scene. Satisfactory relations with the natives were soon established, and, after some weeks, Winslow was sent on a mission to Massasoit, the chief of the Wampanoags, to whom the region belonged. Squanto served as interpreter. On this journey evidences of the epidemic were encountered, which are reported in Bradford's History of Plymouth Plantation [17] more fully than in Winslow's account.

They found his place to be 40 miles from hence, ye soyle good, and ye people not many, being dead and abundantly wasted in ye late great mortalitie which fell in all these parts aboute *three years* before ye coming of ye English, wherein thousands of them dyed, they not being able to burie one another; ther sculs and bones were found in many places lying still above ground where their houses and dwellings had been; a very sad spectacle to behould. But they brought word that ye Narighansets lived but on ye other side of that great bay and were a strong people, and many in number, living compacte togeather, and had not been at all touched with this wasting plague.

Thomas Morton, who enjoys a somewhat dubious celebrity for the scandalous doings at his settlement of Merrymount, near Quincy, Massachusetts, came to the country about two years after the Pilgrims had landed. He has left a pungent book, telling his experiences. Among other things, he corroborates Bradford's statement that skulls and bones of Indians that had died of the epidemic were to be seen lying on the ground in great numbers. He further remarks that ordinarily it was the custom of the Indians to bury their dead ceremoniously.[18]

An amusing incident is told by Winslow,[19] which may be repeated, as it is mentioned in a number of the other early accounts of the epidemic:

Here let me not omit one notable, though wicked, practice of this Tisquantum (Squanto); who to the end he might posses his countrymen with the greater fear of us, and so consequently of himself, told them we had the plague buried in our store-house; which, at our pleasure, we could send forth to what place or people we would, and destroy them therewith, though we stirred not from home. Being, upon the forenamed brabbles, sent for by the governour to this place, where Hobbamock [20] was and some other of us, the ground being broke in the midst of the house, whereunder certain barrels of powder were buried, though unknown to him, Hobbamock asked him what it meant? To whom he readily answered: That was the place, wherein the plague was buried, whereof he formerly told him and others. After this Hobbamock asked one of our people, whether such a thing were, and whether we had such a command of it. Who answered, No; but the God of the English had it in store, and could send it at his pleasure, to this destruction of his and our enemies. This was, as I take it, about the end of May, 1622.

Poor silly Squanto, with his childish lie about the "big medicine" of his English friends, reminds one of the boy who bragged of the mortgage on his father's house. To our thinking, Mr. Winslow took the matter too seriously, but his eye may have twinkled while his pen wrote the harsh words that discipline demanded.

One other reference from Winslow's relations is of importance. Alluding to an expedition to purchase corn from the savages in November or December, 1622, he says: "When they came thither they found a great sickness to be among the Indians, not unlike the plague if not the same." And again in January, 1623: "That (corn) from Namasket (now Middleboro) was brought home partly by Indian women; but a great sickness arising amongst them, our own men were enforced to fetch home the rest." [21] These references have been considered by Dr. Green [22] to indicate that the epidemic which had prevailed among the Indians in the four years preceding 1620 had not died out in 1622, two years after the Pilgrims had begun their settlement.

The present writer's interpretation of the paragraphs quoted from Winslow would be that Mr. Winslow himself was not certain whether or not the great sickness that they saw among the Indians in 1622 was the same as the epidemic or "plague" that had reigned among the savages a little earlier. However that may be, Winslow gives no description of the sickness

[15] Not to confuse them with the Plymouth Company in England, they may be called by the well-known name, "Pilgrims."

[16] The so-called Mourt's Relation, Mass. Hist. Soc. Coll., Series 1, Vol. VIII, p. 203.

[17] Page 63.

[18] Morton, New England Canaan, Book 2, Chapter 3, p. 132, Prince Society Publications, edited by Charles Francis Adams, 1883.

[19] Winslow, Good News from New England, Mass. Hist. Soc. Coll., Series I, Vol. VIII, p. 239.

[20] One of the Indians.

[21] Winslow, Good News from New England, Mass. Hist. Soc. Coll., Series 1, Vol. VIII, p. 239.

[22] Green, Samuel A., History of Medicine in Massachusetts.

prevalent during his own time that affords the slightest clue as to its nature. No mention of the occurrence appears in the writings of three other members of the Pilgrim colony, namely, Bradford, Nathaniel Morton and Cushman.

Thomas Morton, who was personally familiar with the colony, says: "This mortality was not ended when the Brownists of new Plimmouth were settled at Patuxet: and by all likelyhood the sicknesse that these Indians died of was the Plague, as by conference with them since my arrivall and habitation in those partes I have learned."[23]

Phinehas Pratt, who, when an old man, wrote down the story of his early adventures, was one of the planters at Weymouth, Massachusetts,[24] 1622. Pratt says: "Then we maed hast to settle our plantation in the Masachuscts bay—our Number being neare sixty men. Att the same time ther was a great plag Among the salvagis, &, as ym selfs told vs half thayr people died thereof."

References in Bradford's History to an epidemic among the colonists in 1633, called "an infectious fever" (of which Dr. Samuel Fuller died), have led Mr. Charles Francis Adams to count the same as part of the original epidemic of the Indians, although an interval of more than ten years had elapsed.[25] It seems to the present writer not clear that Bradford himself thought there was any connection between them. Bradford is also noncommittal as to the nature of "a great sickness and mortality" suffered by the Indians on the Connecticut River in 1633-1634, which he mentions, although he is careful to speak of a visitation of small-pox among them as a separate matter.[26]

Tradition Accounting for Origin of Epidemic.

Captain Thomas Dermer, referred to above, mentions that he redeemed two Frenchmen who had been held as captives by the Indians for three years (*i. e.*, since 1616). From other sources we learn that these were the survivors of a larger number of shipwrecked French sailors. A curious and pathetic tradition arose which connected the French prisoners with the epidemic among the Indians which appeared about that time. None of the English that were possible eyewitnesses of the epidemic allude to this story. It seems to have been printed first in a book by Captain John Smith, published in 1631.[27] It is also related by Thomas Morton, Nathaniel Morton, by that learned clergyman, the Reverend Cotton Mather, and in an unsigned document in the Public Record office in London. Their versions differ considerably in details, which are, however, of no great importance from the point of view of this paper. The quotation from Mather,[28] which follows, will also serve to show how interest in this epidemic persisted among the Puritans long after the colonies were firmly established. Referring to the settlement of Plymouth he says:

> The Indians in those parts had newly, even about a year or two before, been visited with such a prodigious pestilence, as carried away not a *tenth*, but *nine* parts of *ten* (yea, 'tis said, *nineteen* of *twenty*) among them: so that the woods were almost cleared of those pernicious creatures, to make room for a better *growth*. It is remarkable that a Frenchman who, not long before these transactions, had by a shipwreck been made a captive amongst the Indians of this country, did, as the survivors reported, just before he dyed in their hands, tell those *tawny pagans*, "that God being angry with them for their wickedness, would not only destroy them all, but also people the place with another nation, which would not live after their brutish manners." Those infidels then blasphemously replyed, "God could not kill them"; which blasphemous mistake was confuted by an horrible and unusual *plague*, whereby they were consumed in such vast multitudes that our first planters found the land almost covered with their unburied carcases; and they that were left alive were smitten into awful and humble regards of the English, by the terrors which the remembrance of the Frenchman's prophesie had imprinted on them.

Nathaniel Morton states that the story of the Frenchman was related to the Pilgrims by the Indians.[29] It may also have been reported to Captain Dermer by the Frenchmen whom he rescued from captivity. It is just possible that we have in this curious legend a vague appreciation of the significance of what may have been an actual occurrence, namely, that some of the French sailors may have brought with them the germs of the unknown epidemic disease and that the Indians derived it from them. Knowing what we now do of so-called "carriers" of pathogenic bacteria, that seems not impossible.[30]

Sources of Information.

The citations given above comprise all the facts that the present writer has been able to discover concerning this epidemic, with a few exceptions which will be given below. Although there are numerous other acounts of it or allusions to it, they give no additional information.[31] In all, it has been possible to find twenty-three different writers that refer to or describe it in books, tracts or letters between 1619 and 1677 (excepting Cotton Mather's Magnalia which appeared in

[23] Morton, New English Canaan, Book 2, Chapter 3, Prince Society's Publications.

[24] The Weymouth settlement was the private enterprise of a certain Mr. Weston. See Mass. Hist. Soc. Coll., Series 4, Vol. IV, p. 479.

[25] Charles Francis Adams, editor of Prince Society's Edition of Morton's New English Canaan, note to p. 133; also Three Episodes of Massachusetts History, p. 2.

[26] Bradford, History of Plymouth Plantation, pp. 197, 198, 203.

[27] Advertisement for the Unexperienced or the Pathway to Erect a Plantation, Mass. Hist. Soc. Coll., Series 3, Vol. III, p. 16.

[28] Cotton Mather, Magnalia Christi Americana, Vol. I, Book I, Chapter II.

[29] The writer of the narrative in the Public Record office in London states that he obtained his knowledge from Mr. Oldham (one of the Plymouth colonists who visited England). Smith might have learned it from the same source.

[30] Phinehas Pratt, in his narrative (Mass. Hist. Soc. Coll., Series 4, Vol. IV, p. 479), tells the story of the shipwrecked Frenchmen as it was related to him by one of the Indians. Pratt's account does not connect the Frenchmen with the pestilence, but simply affirms that the captive sailor prophesied that a people like the French would drive the Indians out of the land.

[31] An analysis of the original documents for this period of American history will be found in Justin Winsor's Narrative and Critical History. See also Winsor's essay on The Earliest Printed Sources of New England History, Proceedings Mass. Hist. Soc. Coll., Series 2, Vol. IX, p. 181.

1702). As this study has been made by one without experience in historical research, it is not unlikely that other references exist, which have been overlooked; but it is hoped that nothing essential has escaped notice. Several of the references found are of the nature of merest allusions. The authorities are enumerated at the end of this paper. All of them (except Cotton Mather) were, if not eyewitnesses, at least in a position to have talked with those who had been eyewitnesses of the progress of the pestilence or its effects. This does not include the early historians, Hubbard, Prince and Hutchinson, who appear to have had no sources of information that are not accessible at the present day. Although it seems not certain that any Englishman actually saw the progress of the disease except the party of Vines, it is not unlikely that Dermer, the Pilgrims and Weston's men (Phinehas Pratt) were eyewitnesses of it to a certain extent.

Summary.

The facts obtained from the various sources already mentioned may now be summarized and analyzed.

Date of Epidemic.

An epidemic among the Indians of New England appears to have been reported first by the Vines expedition, for which the date usually assigned is 1616-1617. It is, of course, possible that the epidemic had been in progress for some time before Vines came to America without having attained such proportions as to attract attention. It seems to have continued till 1619 (Dermer), and possibly had not died out entirely as late as 1622 (Winslow, Pratt, Thomas Morton). All the early writers agree substantially that it prevailed during about the period named, except Gookin (writing in 1674), who asserts that it occurred in 1612-1613.

Extent.

Roughly speaking, the epidemic appears to have affected the tribes along the coast from Cape Cod to the Penobscot River. Winslow and several others state particularly that the Narragansett Indians remained exempt from it. Johnson seems to be the only authority for supposing that it reached the Pequots.

The tribes of the region afflicted were the Wampanoags, the Massachusetts, the Pawtuckets and the Abnakis, though it must be remembered that tribal divisions were loose and the statements of the early writers confusing. The limit which the disease reached on the east is not so definitely known as that on the west, because contemporaneous observations from Maine are lacking. The Pilgrims (Winslow and Bradford) refer to the absence of natives on the islands in Boston harbor, all being dead. Christopher Levett, who visited the coast of Maine in 1623-1624, speaks[32] of much excellent cleared land, near what is now York, Maine, "having been planted by the savages who are all dead." The party of Vines is supposed to have been still farther east on the Saco River. Statements of Smith[33] and others indicate that the Indian population was largely destroyed as far as the neighborhood of the Penobscot River. The early writers assumed that one great epidemic occurred over all the region named, and there is no reason to think that their supposition was not correct. Sir William Alexander's description of Nova Scotia in 1623 does not refer to any pestilence among the Indians of that region, but his account is too brief to be of much value.[34]

Mr. Francis Parkman, in his "Jesuits in North America,"[35] makes the following reference to an epidemic among the Huron Indians in Ontario, about 1633 and 1634: "A pestilence, similar to that which a few years before had swept off the native populations of New England, had begun its ravages among them." Parkman makes other references to what was apparently the same epidemic. He also mentions that it returned in 1636 and 1637 with great violence, and that small-pox appeared soon after. Whether or not Parkman intended to convey the idea that the pestilence of the Hurons was identical with that of the Indians of New England is not quite clear. His principal sources of information seem to have been the Jesuit Relations. As far as the writer has been able to discover, there is no allusion in these Relations to the New England epidemic. The succession of events connected with the epidemics was somewhat similar in the two cases, and, we presume, led to the use by Parkman of the word similar. There appears to be no reason for supposing that the two epidemics were identical. It is possible but not probable that they were in some way connected.[36]

Mortality.

The early accounts agree that the mortality was appalling. When they attempt to express the result in figures, probably the figures have no great value. Edward Johnson says that the Massachusetts tribe was reduced from 30,000 to 300 persons. The latter figure may be approximately correct, as Johnson was in a position to estimate the number of living Indians, but that the Massachusetts ever numbered anything like 30,000 may be doubted. And though we may hesitate to assent wholly to the statement made in the tract called The Planters Plea that "such a plague hath not been known or remembered in any age or part," at least we can agree with honest John Smith that "it is most certain there was an exceeding great plague amongst them."

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[32] Levett, A Voyage into New England, etc., Mass. Hist. Soc. Coll., Series 3, Vol. VIII, p. 165.

[33] Smith, New England's Trials, 1622.

[34] Encouragement to Colonies, London, 1624. Prince Society's Publications.

[35] Thirtieth edition, p. 52. Little, Brown & Co., 1892.

[36] Of the disease which afflicted the Hurons, Brébeuf wrote: "This sickness began with a violent fever, which was followed by a sort of measles or small-pox, different, however, from that common in France, accompanied in several cases by blindness for some days, or by dimness of sight, and terminated at length by diarrhœa, which has carried off many and is still bringing some to the grave." Letter of Brébeuf in Le Jeunes' Relation for 1635. Jesuit Relations, etc., ed. Reuben Gold Thwaites, Burrows Brothers, 1897, Vol. VIII, p. 89. See also Vol. XI, p. 13, and Vols. XIII, XIV and XIX, p. 89.

Nature of the Epidemic.

From the pitiably meager descriptions of the epidemic, it is hardly safe to offer a conjecture as to its nature. One notes first the striking immunity of the English from the disease, remarked by the Vines party and referred to by others.[37] This of course suggests that it was some common malady, like small-pox, typhus or measles, from which the English had acquired immunity by having already had it at home.

If the disease was bubonic plague, the English might have appeared to be relatively immune on acount of being better shod and clad, and cleaner than the savages, and, therefore, less liable to small wounds and insect bites, through which the bacilli could be introduced. This is said to be one of the reasons why the English in Hindustan to-day suffer less from bubonic plague than the natives. But it must be remembered that Europeans of the seventeenth century were not so far from savages in their personal habits as are Europeans of the twentieth century.

Gookin, writing in 1674, says: "I have discoursed with old Indians, who were then youths, who say that the bodies all over were exceeding yellow, deseribing it by a yellow garment they showed me, both before they died and afterwards." From this statement Noah Webster[38] concluded that the pestilence was yellow fever; Hirsch,[39] however, considers that improbable. It is certainly not very powerful evidence.[40] If, as Dr. Green believes, the "great sickness" among the Indians reported by Winslow for November or Deeember, 1622, was the same as the great epidemic of the years preceding, that would be an argument against the yellow fever theory; for yellow fever would not be likely to occur so late in the season. Mr. J. H. Trumbull states that the name of the Indians for the plague, translated literally, meant "a bad yellowing" or "being badly yellow." Small-pox was known by a different word.[41]

It will be remembered that Dermer wrote that he saw the sores of some Indians that had recovered from the epidemic who described the spots of such as usually died. Largely on the strength of this statement, Dr. Oliver Wendell Holmes and Dr. Samuel A. Green[42] came to the conclusion that the epidemic was probably small-pox. There is abundant testimony to show that the Indians in various parts of Americа have sustained at times a shocking mortality from small-pox. It has been one of the chief causes of the decline of their race. But the same phenomenon has been observed in the case of other diseases new to the Indians, and has been noted in many parts of the world where new infeetions have been introdueed. Also it must not be forgotten that in those days mortalities in Europe were often very high when pestilences prevailed.

The immunity of the English in New England from the epidemic at the time when the Indians were having it would fit in better with the theory that the disease was small-pox or some other exanthem than with any other. But the very fact that the English were likely to be immune from small-pox by having had the disease ereates a presumption that they were familiar with small-pox. In that case, we should expect, as Mr. Charles Francis Adams very justly observes,[43] that they would call the epidemic among the Indians "small-pox," and *not* by some other name. It is true that in one old traet[44] the following passage occurs: "Thus farre hath the good hand of God favoured our beginnings . . . . In sweeping away great multitudes of the natives by the small-pox, a little before we went thither, that he might make room for us there." The passage has little to do with the remainder of the tract which deals chiefly with Harvard College. It is likely that the writer of the tract confused the earlier epidemie with undoubted and very terrible outbreaks of small-pox among the Indians which occurred after the eolonists arrived, as in 1633. Bradford, Nathaniel Morton and Josselyn particularly refer to small-pox among the Indians as a disease separate from the earlier epidemic or "plague" among the Indians. The Rev. John Eliot, "apostle" to the Indians, spoke of them as "being but a remnant, the Lord using to show mercy to the remnant; for there be but few that are left alive from the Plague and Pox, which God sent into those parts."[45] Remarks made by Roger Williams indicate that the Indians themselves recognized a differenee between the plague and small-pox.[46]

The names given to the epidemic by the original writers are various, usually either *the* plague, a plague or a mortality. In no ease is it ealled small-pox, with the possible exception mentioned above. The most definite designation it receives is that of *the* plague, which is frequently used by the writers as though that were a perfectly-well-known affection. The expression "*the* plague" oeeurs in twelve of the twenty-three original records. With few exceptions the writers were born in Europe, and were no donbt familiar with both bubonie plague and small-pox by reputation and often through experience. During the seventeenth century there were numerous very destructive plagues in England,[47] some of which were undoubtedly bubonic

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[37] Captain John Smith, Advertisement for the Unexperienced, etc., Mass. Hist. Soc. Coll., Series 3, Vol. III, p. 16. The Planter's Plea, Colonial Tracts, No. 3, July, 1898.

[38] A Brief History of Epidemic and Pestilential Diseases, Vol. I, p. 281.

[39] Handbook of Historical and Geographical Pathology, Transactions New Sydenham Society, Vol. I, p. 317.

[40] The Collections of the Massachusetts Historical Society have two notes referring to the frequent occurrence of yellow fever among the Indians, especially on Martha's Vineyard, Series 1, Vol. I, p. 140; Series 2, Vol. III, p. 91. The authors are not named and how much weight should be given them is not clear.

[41] Letters of J. H. Trumbull in the appendix to Dr. Green's History of Medicine in Massachusetts.

[42] Holmes, in Lowell Institute Lectures on Massachusetts and its Early History, published by the Massachusetts Historical Society, 1869. Green, History of Medicine in Massachusetts.

[43] Charles Francis Adams, editor of Prince Society's Edition of Thomas Morton's New English Canaan; also Three Episodes of Massachusetts History, p. 3.

[44] New England First Fruits, 1643, Mass. Hist. Soc. Coll., Series 1, Vol. I, p. 242.

[45] John Eliot, The Daybreaking of the Gospel with the Indians, 1647, Old South Leaflets, VI.

[46] Roger Williams, Letters to John Winthrop, June, 1638. Old South Leaflets, III. See also J. H. Trumbull in the appendix to Dr. Green's History of Medicine in Massachusetts.

[47] Payne, in the Encyclopedia Brittanica, enumerates five plagues from 1603 to 1665. Simpson, in his treatise on plague, quotes

plague. In 1665 occurred the great plague of London, which was bubonic plague beyond question. Contemporaneous English writers such as Evelyn and Pepys called it "the plague," and the same writers speak elsewhere of "the small-pox," with which also they were well acquainted. No doubt the word plague was often used in a general sense, as when our good old friend Mercutio said, "a plague o' both your houses"; and the adjective "plaguey" is still occasionally heard. Nevertheless, it seems probable to the present writer that a majority of the original authorities on the epidemic among the Indians of New England, whether rightly or wrongly, considered that epidemic to be bubonic plague. It is noteworthy that, among the plagues of London during the seventeenth century there was one lasting from 1603 through 1611, while a few deaths from plague were recorded annually for many years afterwards. Remembering that the epidemic among the Indians occurred about 1616 to 1620, it seems quite possible that the germs of "the plague" may have been transferred from England to America.

Source of the Epidemic.

There is no evidence in any of the original records to suggest that the epidemic among the Indians was a disease native to the New England coast, but there are several reasons for thinking that it was not. First, may be noted the great susceptibility of the Indians, and second, the immunity of the English. Ample means for the transportation of an infection were present in Indians that had been taken to Europe and afterwards brought back to America, and in the frequent visits of fur traders and fishermen. It is expressly stated by some early writers [48] that previously this plague had been unknown among the Indians.

It is by no means impossible that other records than those now known of the epidemic that has been the subject of the present paper may yet come to light, and furnish details that will determine definitely the nature of the disease. Reports or journals of Richard Vines, if they exist, would probably do so. The faded letters of some humble fisherman or some forgotten trader may well enough be stored away in an English garret and may be found any day by the curious student. It is not unexpected, although disappointing, nevertheless, that, beyond what has been said on the preceding pages, the matter must for the present be left undetermined.

But, as the principal object of this paper has been to discover whether or not the seeds of the disease were probably brought from Europe to America, the result of the research has been on the whole satisfactory. In the writer's opinion, the history of this epidemic opposes no argument to the principle stated in the introduction—that the American continent seems to have been the birthplace of a remarkably small number of the great infectious maladies of the world.

Baldwin Latham to the effect that severe plague epidemics occurred in London in 1603, 1625, 1636 and 1665.

[48] Smith, Advertisement for the Unexperienced, Mass. Hist. Soc. Coll., Series 3, Vol. III, p. 16. Nathaniel Morton, New England's Memorial, ed. 1826, Danforth, Plymouth, p. 42. Increase Mather, Early History of New England, etc., p. 72.

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THE USE OF SILVER WIRE IN OPENING THE KIDNEY.*
PRELIMINARY REPORT.

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At the suggestion of Mr. Max Brödel, a series of experiments was undertaken to ascertain a method of nephrotomy with a minimal amount of hemorrhage, and to determine the subsequent infarct formation with destruction of kidney parenchyma. As some of the experiments are still in progress, and the histological studies only partially completed, merely a preliminary report of the work will be presented. The individual experiments, together with the resulting infarct formation and destruction of kidney parenchyma, will be considered in a subsequent paper. In this report, we will confine ourselves simply to a brief consideration of the comparative amount of hemorrhage following nephrotomy with the knife and with silver wire.

The researches of Mr. M. Brödel on the anatomical structure and vascularization of the kidney are so well known that little comment is necessary. With his celloidin corrosion specimens, he has beautifully demonstrated the arborescent branching of the renal arteries, and a most casual inspection of these preparations cannot fail to impress one that any method of nephrotomy that would aim to minimize hemorrhage must pay due regard to the character of this branching.

In man and the dog there are, as a rule, two main arterial trunks supplying the kidney, one passing to the anterior, the other to the posterior portion. While studying the tree-like branching of these arterial trunks, the thought occurred: Could it be possible to open the kidney in such a manner as to avoid the two main trunks, and, at the same time, do as little damage as possible to the finer branches?

If it were necessary to pass a wire between two trees the branches of which interlaced, it is obvious that this could be more readily accomplished, and with less damage to the trees, by passing the wire from below upwards than from above downwards. In the upward passage of the wire, the branches would slip aside and the twigs and leaves would be the only structures damaged; whereas, in the downward passage of the wire the less resistant branches would be broken or considerably bruised.

Similarly, were a sharper instrument than the wire used, the same comparative results would be obtained. While all the branches would be severed in its downward passage, a considerable number would undoubtedly escape when the instrument was directed upward.

With these simple facts in mind, it occurred to us that, anatomically, the proper procedure in performing a nephrotomy would be to cut from within outward, and that some blunt instrument which would push the vessels aside would probably give the most satisfactory results.

In order to determine the feasibility of this supposition, a series of nephrotomies was performed on dogs, and the results obtained were very definite and gratifying. A No. iii silver wire was used as the blunt instrument, and proved very satisfactory, its pliability and low tensile strength making it almost impossible to tear any of the larger branches, providing ordinary care was exercised in pulling the wire slowly outward.

Two series of experiments were performed to determine, first, whether the direction of the incision had any appreciable effect on the resulting hemorrhage; that is, whether the hemorrhage would be less if the knife was passed from the region of the kidney pelvis out through the cortex and capsule, than from the capsule into the pelvis; secondly, whether the hemorrhage would be lessened and more readily controlled if a silver wire was used in lieu of the knife in splitting the kidney from within outward.

In the first series of experiments, where the knife alone was used, all the incisions were made in a plane at right angles to the curved vertical axis of the kidney. Two incisions were made in each experiment, one by passing the knife from cortex to pelvis, and the other by transfixing the kidney in anterior-posterior manner close to the pelvis, and bringing the knife out through the cortex. Both of these incisions were made at a level of about 2 cm. from either pole and carried through the center of the lobule situated between the central and upper or lower polar lobule.

In each instance, irrespective of whether the incision from pelvis to cortex was placed near the upper or lower pole, the hemorrhage was appreciably less when the knife was directed from pelvis to cortex than from cortex to pelvis. Unfortunately, however, accurate measurements of the amount of blood lost in a given interval of time were made in only one of the experiments of this series.

In this experiment, the incision near the upper pole was made from within out, and 11 cc. of blood were lost in 20 seconds. From an incision near the lower pole, similar in extent and depth, but differing in that the knife was carried from without in, 16.5 cc. of blood were obtained in the same interval of time.

* Demonstrated before the Interurban Surgical Society, April, 1909.

In the second series of experiments, both the knife and silver wire were used, and the experiments divided into two separate groups:

(1) Those in which the incisions were made in planes at right angles to the curved vertical axis of the kidney.

(2) Those in which the kidney was split from pole to pole in a plane parallel with the sagittal plane of the kidney.

In the first group, the knife was used in making the incision near one pole and the silver wire near the other pole. The silver wire was usually employed first. A No. iii or No. iv silver wire threaded on a Kousnietzoff-Cullen straight liver needle was passed transversely through the kidney at the upper level of the pelvis. The capsule was then nicked with a knife from the point of entrance of the wire around to the point of exit. This procedure was found necessary to avoid troublesome bleeding from the tearing of the capsule. With the kidney firmly held in the hand of the assistant, the wire was readily brought out through the cortex by a gentle see-saw motion.

Too much emphasis cannot be placed upon the necessity of firm counter traction on the kidney as the wire is being brought to the surface, as sudden or too violent traction might result in the tearing of the renal vessels.

On examination, the cut surfaces appeared almost as clean-cut as if a knife had been used. The amount of hemorrhage in a given time of 20 seconds was then accurately measured. The cut surfaces were next approximated, and, in several instances, the bleeding, which was only a slight venous ooze, was so slight that a mere approximation of the two surfaces checked all bleeding, and had it been possible to keep the surfaces pressed closely together the kidney could have been safely dropped back into position without a single suture being necessary.

At the suggestion of Dr. Harvey Cushing, superficial mattress sutures of fine black silk were employed in place of deep catgut sutures, which occasionally included one of the larger renal arterial branches, leading to a considerable infarct formation, an accident which, as can be readily seen, would make it impossible to determine just how much of the infarct formation could be ascribed to the effect of the incision, and how much to the disturbance of the blood-supply caused by the offending suture. This disturbing factor was only encountered when the incision was made with the knife from cortex to pelvis, and though the hemorrhage was only partially controlled by the superficial mattress sutures, a considerable hematoma usually formed between the cut surfaces. This type of closure was employed in all our nephrotomies. On the other hand, the ease with which all hemorrhage was controlled by these superficial silk sutures, which included only a small portion of the capsule and kidney cortex when the nephrotomy was performed with the wire, was very striking.

The results obtained in this group of experiments were very satisfactory. Examination of the cut surfaces where the knife was employed showed free hemorrhage, with some actively spurting arteries. On the other hand, the surfaces cut by the wire presented quite a different picture. There was a rather free venous oozing, but only occasionally was an actively spurting artery observed. In the first instance, pressure on the renal artery was necessary to allay the hemorrhage; whereas, in the second instance, there was a gradual abating of the bleeding, and, in some cases, the bleeding ceased entirely at the end of two or three minutes. The amount of blood lost in those experiments where the wire was used varied from one-ninth to one-half the amount lost when the incisions were made with the knife.

In the second group of this series of experiments, the kidney was split open from pole to pole and the pelvis of the kidney widely opened. This was accomplished in some cases by incising with the knife from cortex to pelvis, and in the other cases by drawing the silver wire from the pelvis of the kidney out through the cortex.

In the latter instance, the method of procedure was as follows: A No. iv silver wire, threaded on a straight liver needle, was passed through the kidney from pole to pole, no particular effort being made to enter or avoid entering the pelvis of the kidney, for the reason that if, after drawing the wire out through the cortex, it was found that the pelvis had not been opened, it was a simple matter to pass the needle and wire through the pelvis and, with a see-saw motion, pull the wire through the wall of the pelvis, and thus widely open the pelvis. The danger of piercing or seriously injuring any of the large branches of the renal vessels in the region of the pelvis is minimal, providing the needle is pushed slowly through the kidney parenchyma, and is slightly deflected whenever it encounters any resisting structures. Sometimes, when the needle impinges against the wall of the pelvis of the kidney, one hesitates to push the needle any farther, fearing lest it may be one of the large renal vessels. Under such circumstances, a little reconnoitering with the blunted end of the liver needle will usually dispel the doubt. If it is the wall of the pelvis that is the barrier, a slight deflection of the needle in any direction will fail to free the end of the needle; whereas, if it is a vessel, the same maneuver will cause the needle to slip by readily.

In none of our experiments have we had the least trouble from any hemorrhage by transfixing the kidney in this manner, and with only one or two exceptions, the needle and wire were always passed through the pelvis.

With the wire in position, the next step in the operation was to split the capsule of the kidney in a line joining the points of entrance and emergence of the wire. The reason for this has previously been mentioned. This preliminary procedure finished, the wire was drawn up through the cortex with a gentle sawing motion, much as one uses a Gigli saw in cutting the bones of the cranial vault, preparatory to doing a "bone-flap" operation. The ease with which the kidney could be split by this method was surprising, the wire passing very readily through the parenchyma.

Whenever the wire encountered any of the more resistant structures, such as the blood-vessels, the fact was at once evident to the operator, and it was only necessary to deflect the wire a trifle to avoid injuring the same. No special effort

was made to direct the wire, except to bring it out somewhere near the median sagittal plane of the kidney. By allowing the wire to follow in the plane of least resistance, the kidney was invariably split in the avascular zone or Brödel's line, and with a comparatively insignificant amount of hemorrhage. Only rarely was a small spurting vessel observed, even though no effort was made to control hemorrhage by pressure upon the renal vessels; a pictue in marked contrast to that presented when the kidney was similarly opened by cutting with the knife from cortex to pelvis. As a rule, the hemorrhage was merely a free venous oozing, which frequently was entirely controlled by pressing hot sponges (110° F.) against the cut surfaces for several minutes.

How insignificant the hemorrhage may be was well illustrated in one experiment where, after the kidney had been split from pole to pole and the pelvis opened, it was left undisturbed outside of the body of the animal while the other kidney was being operated upon. Though the renal vessels at the hilus of the kidney were not compressed in the least, and the kidney, pulsating synchronously with every heartbeat, was laid open like an open book, there was practically no bleeding from the eut surfaces several minutes after the incision had been made.

With one or two exceptions, a mere approximation of the cut surfaces controlled all hemorrhage. However, before replacing the kidney, a number of fine black silk sutures, including only the capsule and a small portion of the eortex, were used to maintain the approximation rather than to control hemorrhage.

Comparative measurements of the amount of blood lost in twenty seconds, showed that from one-eighth to one-fourth less blood was lost than when the nephrotomy was performed with the knife. From what has been said before, one would imagine that the hemorrhage when the silver wire was used should have been considerably less than our measurements indicated, but the reason for this apparent discrepancy is readily apparent. Our measurements of the amount of hemorrhage were all taken immediately after the incision had been made, at a time when there was a free venous oozing, and had it been possible to measure the amount of hemorrhage for a longer interval of time—two to three minutes—the differenee would have been most pronounced. All the animals upon which the nephrotomy was performed with the wire could have withstood this prolonged bleeding test without any danger of bleeding to death, for in these the bleeding beeame progressively less.

On the other hand, few, if any, of the animals eould have recovered such a test when the knife was used. It is emphasized, therefore, that the value of the silver wire method of nephrotomy lies more in the rapidity with which the hemorrhage abates, and the ease with whieh it can be controlled, than in the actual amount of blood lost in a given interval of time.

As yet, we have had little opportunity of applying this method of nephrotomy in the operating room. Several months ago, Dr. Thomas S. Cullen kindly consented to use the wire in a case of nephrolithiasis. Nephrotomy was performed and the wire proved most satisfactory. Since then, nephrotomy with the silver wire has been performed in three eases in Dr. W. S. Halsted's surgical clinie of the Johns Hopkins Hospital by Dr. Hugh H. Young and Dr. Charles Remsen, with satisfactory results.

In operating upon the human kidney a large eurved liver needle is often preferable to a straight one. If the kidney is unusually large the splitting may be performed in two stages, each polar half being split separately.

This report, as was stated, is merely preliminary, and the individual experiments, together with the histological findings, will be considered in detail in a subseqnent paper.

We are greatly indebted to Mr. Brödel, who has advised and directed us in our experiments. Dr. Harvey Cushing has aided us in many ways and has given valuable suggestions. We wish also to express our thanks to Dr. S. J. Crowe of the Hunterian laboratory for his eourtesy and assistance.

NOTES ON NEW BOOKS.

The Principles and Practice of Medicine. Designed for the Use of Practitioners and Students of Medicine. By William Osler, M. D., F. R. S., F. R. C. P., Regius Professor of Medicine, Oxford University, Honorary Professor of Medicine, Johns Hopkins University, Baltimore. Seventh edition. (*D. Appleton & Co., 1909.*)

The appearance of the seventh edition of this well-known textbook scarce needs words of commendation. The fame of its author, his keen insight into both the clinical and the laboratory sides of internal medicine has made this book the standard throughout the English-speaking world.

We take pride in hearing that French and German editions have already appeared, and Spanish and Chinese translations are in the course of preparation. In view of the extraordinary rapidity of the progress of our knowledge of acute infections, the author has found it necessary to issue the present edition after the short interval of three years.

Hc has incorporated within a volume of practically the same number of pages as previously all of the more important advances in internal medicine and serum-therapy, and the indications for surgical interferencc in internal diseases.

The work as a whole shows most careful revision and it will be necessary to mention only a few of the more important changes. Under the section devoted to Discascs Due to Animal Parasites we find reference to the latest work of Schaudinn in distinguishing between the pathogenic and non-pathogenic forms of amœbæ. The results of the new studies in trypanosomiasis, and an entire new symptomatology of the so-called tropical splenomegaly are included. In dealing with the question of prophylaxis in malaria a most generous tribute is paid to the splcndid work of Gorgas on the Canal Zone, in the extermination of the "greatest scourges of the race."

Few changes are to be noted in thc chapter devoted to typhoid fever. We are struck by the figures, giving the enormous annual sacrifice of human life made to this direful disease. From 35,000 to 40,000 deaths are credited to it annually. In view of the great

number of recent papers and statistics in which a more liberal feeding of typhoid patients is advocated, it is surprising that no changes are found in the paragraphs devoted to the diet in typhoid fever.

The merry war waged between the liberal and the restricted diet factions continues and is far from being settled. Dr. Osler seemingly prefers to adhere to his old belief of a more or less restricted diet.

In accordance with the findings and results of the recent Washington Congress for the Study of Tuberculosis, we find much new matter in the section devoted to that disease. In summing up the discussion as to the relative importance of the various portals of infection, he characteristically says: "The truth is that this ubiquitous bacillus is not particular and gains entrance through many portals—throat, lungs and intestines. The important matter for the individual is the nature of the soil on which it falls."

Again, in closing this chapter, he addresses the general practitioners, as follows: "The battle against this scourge is in your hands. Much has been done, much remains to do. By early diagnosis and prompt, systematic treatment of individual cases, by striving in every possible way to improve the social condition of the poor, by joining actively in the work of the local and national anti-tuberculosis societies you can help in the most important and the most hopeful campaign ever undertaken by the profession."

He mentions the new discoveries and advances in the study of syphilis; the use of serum in the treatment of cerebro-spinal fever; and the fact that new light has been thrown upon the etiology of Malta fever as a result of the British Government Committee's investigations. Two new fevers appear in the list of "Infectious Diseases of Doubtful Nature," namely, Rocky Mountain spotted fever (tick fever) and the swine fever.

In Section IV, on the "Diseases of the Stomach," much new matter has been added to the subject of the site, relative occurrence and question of perforation in peptic ulcers, gastric and duodenal—new figures based upon the report of the Mayo's series of 1908, and Musser's series. The indications for surgical interference are clearly stated.

Even in a casual reading of the section upon "Diseases of the Nervous System," we find many new and interesting facts. The work of Marie and his pupils upon aphasia is emphasized. The subject of psychasthenia receives much deserved attention and with the author's clear and forcible style the reader is made to grasp the essentials of this important malady.

A most striking paragraph is written concerning what the author pleases to designate "the cult of the day—faith healing," in which is exemplified an agent used in all ages, the prayer of faith.

J. S. B.

Therapeutics of the Circulation. By LANDER BRUNTON, Kt., M. D., D. Sc., etc. (*Philadelphia: P. Blakiston's Son & Co., 1908.*) Price $1.50.

The books consists of a series of eight lectures delivered by Sir Lander Brunton in the physiological laboratory of the University of London in 1905. As stated in the preface, the purpose of the lectures as laid down by the university is to present the results of recent investigations by the investigators themselves, orally and with experimental demonstration in the lecture-room, and outside the lecture-room by monographs approved by the university. Such is the nature of the book under review, and at the outset it may be stated that it is in no sense to be regarded as a comprehensive and exhaustive treatise of the subject titled by "Therapeutics of the Circulation." It is, however, a book which is unique in medical literature, for so far as is known to the reviewer, it is the most successful attempt as yet made in manual form to correlate the results of laboratory and experimental work with clinical observation.

The first two lectures and part of the third are devoted to a consideration of the more important physiological facts concerning the heart and blood-vessels. They are stated in a clear and convincing manner and it cannot fail to impress the reader that the writer is a master of his subject. Special stress is laid on those facts which have a direct bearing on treatments, as for example the "Self-massage of the Heart," where it is shown that the nutrition of the heart is dependent to a large extent upon its own activity. The writer also draws attention to many other conditions which are either overlooked or regarding which erroneous impressions are apt to be held. How few medical men grasp the significance of the fact that diastole is the method provided by nature for the "sleep of the heart." It is seldom that one finds in clinical textbooks so lucid an account of the nervous and muscular conduction in the heart. It is a subject which demands ever increasing attention on account of the various disturbances of conduction which are now being recognized clinically. It is, perhaps, in this respect only that the book may be said to be incomplete, for no account is given of the venous pulse from a study of which the various disturbances of conduction can be recognized.

The fourth and fifth lectures give a brief account of the diseases of the circulation and the indications for treatment, while the sixth lecture deals with the various drugs commonly employed in the therapeutics. The seventh and eighth lectures treat of the methods and means at our disposal for combating the disturbances of the circulation in general.

The book is one which ought to find a place in the library of every medical man. It will be especially valuable for the general practitioner who desires to keep abreast of the recent advances in the physiology and therapeutics of the circulatory system.

H. A. S.

Scientific Memoirs—New Series, No. 35. By Officers of the Medical and Sanitary Departments of the Government of India. *Black-Water Fever.* By CAPTAIN S. R. CHRISTOPHERS, M. B., I. M. S., and C. A. BENTLY. (*Printed at the Government Monotype Press, Simla, 1908.*)

This paper is a valuable monograph on an obscure disease by men who are very familiar with the clinical picture of black-water fever in India. It comprises their experience, which is extensive.

In the introduction the authors discuss the various theories concerning this disease.

1. That black-water fever is a pernicious form of malarial attack.

2. That black-water fever is a quinine intoxication.

3. That black-water fever is a distinct disease due to some specific organism.

4. That black-water fever is the result of a condition brought about by repeated malarial infection lasting over a certain time.

Much evidence is brought to show that the geographical distribution of black-water fever corresponds with that of malaria. The clinical picture of the disease is detailed at considerable length. The authors' studies were carried on in the Duars, a district in India where black-water fever is prevalent. Many statistics are brought forward to show that black-water fever appears in regions where the malarial infection is heaviest. This is true in the Duars. The most frequent parasite is the malignant Tertian (Aestivo-Autumnal parasite). The cases are rare in foreigners residing in India less than six months—most frequent in the second and third years of residence. The authors confirm the findings of other writers, that there is no parasite peculiar to this disease. They lay great emphasis on the history of repeated malarial infections as a very important factor in the causation of black-water fever. They look at this disease as a distinct morbid process which is induced by malaria. The urinary findings are reviewed at some length. The blood changes are studied carefully.

They emphasize some early changes in the red blood-cells—the presence of many small, swollen, pale, spherical red blood-cells, "spherocytes." Splenic puncture was a routine procedure. Smears showed malarial pigment as a rule and many "spherocytes." The most unusual thing was phagocytosis of the red blood-cells by large mononuclear cells. Their autopsy material was limited to two cases and was decidedly unsatisfactory.

Chapter II.—A review of the various types of hemoglobinuria.

1. Parasitic—piroplasmosis.
2. Paroxysmal.
3. Burns.
4. Transfusion.
5. Injection of chemicals.

Two types of blood destruction are pointed out:

1. Phagocytosis of damaged but intact red blood-cells.
2. Solution of red blood-cells in plasma.

They find no evidence of alteration in osmotic tension in black-water fever. The relation of corpuscles to plasma is normal. They consider quinine of no etiological importance, but state that some cases may show a true hemoglobinuria following quinine. They think there is good evidence in favor of the theory that in black-water fever some specific hemolysin is present. It cannot be demonstrated in man or in animals. It is due to a condition following repeated attacks of malaria and precipitated by an acute attack. Perhaps due to something which the body produces as a reaction against these repeated attacks (an autolysin?).

Prophylaxis—prevention of malarial infection and prompt quinine treatment.

The bibliography is complete.

Diseases of the Heart. By James Mackenzie, M. D., M. R. C. P. 385 pages. (*London: Henry Frowde and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

In his first book, "The Study of the Pulse and Movements of the Heart" (1903), Mackenzie practically created the epoch of physiological analysis in the clinical study of the diseased heart. With the application of a simplified technique for obtaining simultaneous tracings from the veins, apex and arteries, he was a worthy successor to Marey and Francois-Franck in enabling the clinician to study the patient's heart, as Engelmann had studied the frog's heart, from the standpoints of rhythmicity, irritability, conductivity and contractility. The book contained a vast number of valuable and interesting suggestions deduced from his physiological analyses, arranged in accordance with its bearing upon disturbances of function regardless of the associated lesion. Not the least important feature was the length of time over which his observations extended, many over ten years duration, permitting a completeness of view that had never been equaled.

The book upon diseases of the heart is based upon a far larger experience added in the five years that have elapsed, during which Mackenzie's graphic methods have come into general use. It can thus be safely said to be founded upon a larger clinical material than has ever before been studied physiologically. In this work Mackenzie has aimed "to ascertain the mechanism by which symptoms are produced, to find out their relationship to organic changes in the heart, to ascertain their prognostic significance, and finally to employ them as a guide for treatment." If the writer intends the book for the use of the general practitioner, as he insinuates, he would be unjust to himself. The tone of the book, as he admits in the preface, is controversial rather than judicial, intended to convince the medical public of the practical use to which the study of venous tracings can be put, and also to substantiate the theoretical explanations which have been advanced by the author. Accordingly, one who is not already familiar with these phases of the subject, though deriving a wealth of information, would see but one side of many controversies. The fact that a good bibliography is given at the back of the book does not make up for the lack of discussion in the text. In accordance with this principle, which is quite justifiable in a brief work if admittedly controversial, the writer has introduced a good many rather dogmatic groupings of clinical conditions, especially in regard to the alterations of rhythm.

The writer designates as sinus irregularities those arrhythmias, neurogenic or myogenic, in which the venous tracings show that the auricles take part in the arrhythmia; and as nodal irregularities those in which no wave due to auricular contraction can be seen. He assumes that the rhythm here begins in the Purkinje cells of His' bundle at Tawara's nodal point (Knotenpunkt) in the interauricular septum. In the present state of our knowlege one may well hesitate to accept this interpretation, especially since Retzer's anatomical studies indicate that Tawara's nodal point, if it have any structural existence at all, lies within the sinus portion of the auricle. Even in the absence of these studies the classification and grouping is based upon much that is hypothetical.

The all-pervading doctrine that the Purkinje cells initiate many forms of cardiac rhythm, though probable in many cases, is also still hypothetical, and might well be treated with some reservations. Instances like the above are numerous; but, representing the author's views, ingenious and plausible even if not strictly proved, they may be read, in a judicial attitude, with interest and profit.

The book is confined to one phase of the question in cardiac disease. Studies by methods other than those of the venous pulse —the older questions of physical diagnosis on the one hand, and the newer questions of X-ray studies, electrocardiograms and electrophonograms receive practically no discussion. The author alludes to determinations of blood pressures (maximal pressure only), but has made no adequate use of the information obtainable by this means. Congenital heart diseases are mentioned in one page, the heart of Basedow's disease in three scattered paragraphs.

On the other hand, the chapters are brief and the statements are made rather dogmatically without putting the reader into a position to weigh the evidence upon which they are founded. One particularly misses detail in the discussion of the extrasystolic irregularities, in which the writer is rather noncommittal. This cannot fail to be a source of regret. The life-work of a master cannot be compressed into a few pages, and detailed discussions based upon his thousands of careful studies would be gratefully welcomed. Moreover, they would serve as a lesson to show how one man has availed himself of the wealth of material for research that falls to the lot of every busy practitioner.

Treatment also is not discussed with any degree of completeness, but only in its bearing upon the one phase in which the author is interested. The intravenous use of strophanthin and numerous other important modes of treatment are not mentioned. Brauer's cardiolysis for the relief of adherent pericardium receives one line. Paracentesis pericardii is not mentioned, and the writer states that he has "never found any very serious embarrassment of the circulation from extensive pericardial effusion" (!)—a fact at variance with universal experience and experiment.

However, like many dishes which must be taken with a few grains of salt, the book contains much that can be ruminated on long and carefully and that will contribute to the mental growth of the reader.

The Harvey Lectures. Delivered under the auspices of the Harvey Society of New York, 1906-1907. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

The Harvey Society is performing a very real service for the profession. The present volume marks the completion of its sec-

ond year and fully maintains the high standard set during the first year of the existence of the society.

The lecturers in the second course included Drs. Wright, Herter, Porter, Adami, Meltzer, Benedict, Wilson, Huntington, Councilman and Müller, a list of names which does honor to the selective judgment of the officers of the society.

The first of the series of lectures was delivered by Sir Almroth E. Wright, of London, and was devoted to a consideration of the principles of vaccine therapy. No subject perhaps has been more interesting to the profession at large during the past few years than the attempt at adaptation for therapeutic uses of the protective mechanisms which bacteriologists have shown us are called into play in the animal organism during the processes of immunization. Dr. Wright reviewed existing knowledge concerning the activity of leucocytes and of the various anti-bacterial substances in the body fluids in these protective processes.

It was natural that he should pay especial attention to the opsonins inasmuch as these substances are the particular bacteriotropic elements toward which his own researches have been especially directed. His studies and those of his pupils have led him to believe that the determination of the so-called opsonic index by his method is the best means we have of measuring the immunizing effect produced by the inoculation of bacterial vaccines. While many workers on immunity problems believe Sir Almroth Wright's enthusiasm has gone somewhat beyond the mark, all must be grateful for his clear and concise presentation of his views as summarized in this lecture. Just now there is a pronounced reaction among clinicians as regards the use of opsonic methods, a reaction which perhaps could have been prophesied at the time of their very enthusiastic exploitation. The danger is that this reaction will go too far and that young clinical investigators will be deterred from study in a field which is certainly of great scientific importance, even if the clinical application of the results has been somewhat premature.

The title of the second Harvey Lecture, given by Dr. C. A. Herter, of New York, is "The Common Bacteriological Infections of the Digestive Tract and the Intoxications Arising Therefrom." The well-known researches of this author upon the bacterial flora of the digestive tract at various stages of life in health and in disease have led him to form some interesting conceptions regarding the pathogeny of certain diseases of digestion, of the blood, of the joints and of the nervous system. His studies have included a careful analysis of the chemical products of intestinal fermentation and putrefaction, and it is with the relation of these various products to certain clinical types of disease depending upon individual susceptibilities and reactions that the lecturer chiefly deals. The limits of this review do not permit us to do more than mention his three main types of chronic excessive intestinal putrefaction; namely, the indolic type, the saccharo-butyric type and the combined type. In the indolic type members of the colon group appear to be responsible. In the saccharo-butyric type Herter believes that the *Bacillus aerogenes capsulatus* is the main enemy, while in the combined type, presumably due to both forms of intestinal putrefaction, there is a profound disturbance of the bacterial processes in the gut leading finally to pernicious anæmia, to melancholia and to other serious disorders. The lecture closes with brief directions as to the therapeutic management of these different types of intestinal disease.

The professor of comparative physiology in Harvard University, Dr. Porter, delivered the third lecture and chose as his subject "Vasomotor Relations." This lecture deals with phases of the circulatory function which are far too little thought about by practitioners of medicine. In the first part of his lecture the speaker dealt with the relations of the vasomotor nerve cells to shock. His experiments have shown that the vasomotor cells retain their irritability in spite of the extensive injury of peripheral organs and tissues, and furthermore that stimulation of foreign nerve trunks has only a momentary effect upon the general blood pressure. He lays great stress upon the relative or percental change in blood pressure, since he regards this as the true index of the condition of the vasomotor cells and he finds that it increases as the blood pressure falls.

Porter draws a clear distinction between the symptoms of shock and shock itself. With the former, clinicians are well acquainted, but the explanations of the latter are as yet purely hypothetical. The lecturer maintained that the hypothesis usually put forward declaring that the vasomotor cells are depressed, exhausted or inhibited by excessive stimulation of afferent nerves is untrue and it must be admitted that his experiments seem conclusive.

The studies of vasomotor phenomena are much complicated by the fact that the vasomotor system is composed of at least three separate superimposed series of neurones, one in the medulla oblongata, a second in the medulla spinalis and a third outside the cerebro-spinal nervous system. Each of these links in the vasomotor neurone-chain has essentially individual functions. These neurones of different order react differently to the same stimulus and there seems to be no doubt now that there are specific differences in these different sets of neurones, a fact which will have to be considered if a therapy of the vasomotor cells ever be established.

Dr. Porter's lecture impresses one with the great complexity of the problems dealing with the peripheral circulation and one leaves the speaker with the conviction that we can scarcely hope to have new knowledge in this field except through the slow answering of single questions under conditions in which the varying factors can be successfully controlled, that is through animal experimentation in the laboratory.

A subject hitherto almost unknown to medical men was dealt with by Dr. Adami under the caption of "The Myelins and Potential Fluid Crystalline Bodies of the Organism." Though physicians are familiar with the microscope, very few of them have had experience with a polarizing apparatus applied thereto. The polarization microscope, however, has proven to be most valuable in the study of myelin droplets and similar substances in the animal body. When myelin from the adrenal or from an atheromatous aorta is examined between crossed Nicol's prisms one sees on the globules an exquisite black cross between four illuminated sectors. Ordinary fat behaves entirely differently.

The fact that myelin is doubly refractive was observed as early as 1862, but was lost sight of until recently. Klotz's studies upon the formation of calcium soaps in the organism led Adami and Aschoff to an examination of the relation of these soaps to myelin bodies. The close relation of simple calcium soaps of oleic acid to myelin was soon established, and further study revealed the fact of the kinship of the myelin bodies to crystals. The physicists have for some time been acquainted with what are now known as fluid crystals, and examination proves that the doubly refractive crystals known as myelin are in reality fluid sphero-crystals. In all probability they are soaps of oleic acid of greater or less complexity, those of them in the nervous system being perhaps combinations of oleic acid with cholin, neurin, cholesterin or lecithin. These studies appear to be of great importance and it seems probable that they will prove to be fundamental not only in histological studies, but also in connection with the problems of the metabolism of fat.

So much has been said and written of late regarding the protein minimum, Fletcherizing and special limited dietaries generally that many will welcome the views advanced by Dr. Meltzer, in his lecture entitled "The Factors of Safety in Animal Structure and Animal Economy," in which more liberal dietaries are not only condoned, but held to be essential for the safe-guarding of the organism.

The volume contains also important addresses by Prof. Benedict on metabolism during inanition, by Prof. Wilson, on recent studies of heredity, by Prof. Huntington on the development of the genito-urinary tract, by Prof. Councilman upon the lymphoid tissue in infections and by Prof. Friedrich Müller on nervous disorders of the heart.

It is probable that this volume will find its way into the library of many progressive physicians.

Graphic Methods in Heart Disease. By John Hay, M. D., M. R. C. P. With an Introduction by James Mackenzie, M. D., M. R. C. P. (*London: Henry Frowde and Hodder & Stoughton, 1909.*) *Oxford Medical Publications.*

As Hay points out in this volume, the careful clinician of to-day is no longer satisfied with merely recognizing the presence and nature of a cardiac lesion. He tends to lay less stress on the character of the organic lesion and more on the determination of the "area of cardiac response." The important question to decide in any case is, after all, not what the pathological anatomy of the heart is, but what it is doing, and what it is able to do. In the solution of the problem of functional diagnosis, the adoption of graphic methods for registering the movements of auricles and ventricles, as they are evidenced in the arteries and veins, has proved of great value. Within the last few years the new methods have been widely adopted, and they are now recognized as having a very distinct value and interest. While there are many men actively engaged in doing cardiographic work, there is a much larger number, who, unable to take it up practically, desire to get a general idea of the subject. One of the difficulties which has hitherto confronted the beginner in the study of this new field of diagnosis has been the inability to obtain any single article or book which puts the whole subject before him in a simple, comprehensive manner, and within a moderate space. The want of an elementary handbook in the study of graphic methods in heart disease, Dr. Hay has most successfully filled. In small compass, and in a most readable style he has brought together the essentials of the subject so that it is possible for anyone to obtain a good, general understanding of it. For those who desire to go deeper, and to do cardiographic work themselves, the book will serve as a foundation, and will prove of constant value for reference. The first two chapters give some of the more important points in cardiac anatomy and physiology. The third chapter describes some of the commoner forms of instruments. The rest of the volume is taken up with explanations of normal tracings, and of tracings representing the various types of functional disturbance. There are numerous illustrations of excellent cardiographic records. One might, perhaps, desire more references to the works of other authors, but these have evidently been purposely omitted with a view to keeping the book as simple as possible. F. W. P.

Severest Anæmias. Vol. I. By William Hunter. (*London: MacMillan & Co., 1909.*)

This book will be read with great interest by hematologists and clinicians alike who are interested in the large group of diseases comprised under the title anæmia. The special interest centers, of course, in Dr. Hunter's own views as to the so-called progressive pernicious anæmia. He has been an earnest student of the subject for many years and his contributions cover a long period (1885-1909). This first volume is given up to the historical discussion, etiology, pathology and nomenclature of what he says should be called "Addisonian anæmia." The historical section is a very complete review of all the work on this "clinical entity" from Combe (1822) to the present time.

He shows beyond peradventure that the priority for the clinical feature and some of the more important of the pathological findings and the recognition of the disease as *sui generis* belong to the English school, antedating Biermer by many years.

He attacks and shows the inconsistencies in Biermer's and Ehrlich's concepts, and quotes Prof. Gairdner's criticism to the effect that the German tendency to group clinical "casuistic" into conformity with *à priori* laws had led to a confusion of the original idea of Addison. In the sections on etiology and pathology he makes a very strong argument not only for the toxic idea of origin as opposed to any primary bone marrow changes but for the separation of the Addisonian anæmia as a specific infective disease, characterized by (1) glossitis—infection of stomach and intestines; (2) hæmolytic changes (of portal source), specific and characteristic for this form, seen specially in spleen, liver and kidney; (3) bone marrow hyperplastic changes, which are a result of the foregoing and which vary with the degree of the specific and secondary infective processes. The sections, photographs and descriptions of the infective changes in the mouth and stomach are very striking, but will be better considered with the clinical notes in the second volume. Altogether, whether one agrees with Dr. Hunter or not, his presentation of the subject is highly engrossing and it is hard to put the book down unfinished.

T. R. B.

Reports of the Sleeping Sickness Commission of the Royal Society. No. IX. Price 1/6. (*London: Darling & Son, 1908.*)

This number of the reports contains five monographs covering the distribution of sleeping sickness in Uganda and the summary of the observed facts with relation to the biology and epidemiology of the disease. There is also a discussion of the prophylaxis and treatment. Three of the papers take up the experimental side, with especial reference to the effect of various drugs on trypanosomiasis in rats. The conclusions are very interesting and may be summed up to the effect that no drug yet thoroughly studied effects a permanent destruction of this infection, but that all cases recover after various intervals of time.

Under certain conditions the trypanosomes may become quite resistant to atoxyl and remain in the circulating blood in spite of large and frequent doses. Sodium antimonyl tartrate, recommended by Aders Plimmer, seems to possess remarkable toxic properties for the trypanosomes without being poisonous to the rats used in experiments. Some rats treated with this drug had remained free from parasites for 152 days at time of publication. Further studies of this drug are promised.

Lastly, there is a full index of the first nine numbers of the reports appended to this number. T. R. B.

A System of Operative Surgery. By Various Authors. Edited by F. F. Burghard, M. S. (Lond.), F. R. C. S. (Eng.), Teacher of Operative Surgery in King's College, London. Surgeon to King's College Hospital, etc. In four volumes. (*London: Henry Frowde and Hodder & Stoughton, 1909.*) *Oxford Medical Publications.*

Volume I is divided into nine sections as follows: I, Principles and Technique of Wound Treatment; II, Methods of Local Analgesia; III, Amputations; IV, Operations Upon Arteries, Veins and Lymphatics; V, Operations Upon Nerves; VI, Operations Upon Muscles, Tendons, Tendon Sheaths and Bursæ; VII, Operations for Non-Tuberculous Affections of the Bones; VIII, Operations for Non-Tuberculous Affections of Joints; IX, Plastic Surgery.

The editor in his preface says that in order to present faithfully the present position of British Operative Surgery, the plan has been adapted of securing the co-operation of a number of prominent British surgeons, each writer dealing with a branch of the subject in which he has had special experience.

In the section on the Principles and Technique of Wound Treatment the percentage of suppuration in clean cases operated on in

hospitals is given as a little less than 5.84 per cent. This is a much larger per cent of suppuration than we are accustomed to have in clean cases in our hospitals, where the technique is acknowledged to be of the first class.

There is quite a complete résumé of Barker's work on Local and Spinal Analgesia in which he recommends spinal analgesia to reduce the shock in severe injuries to the lower extremities.

The most complete sections in the book are those written by the editor himself, and they cover the ground thoroughly, although some of the operations generally accepted in this country as the most satisfactory are not mentioned; for example, the suturing of the aponeurosis and periosteum in fracture of the patella instead of wiring the fragments.

The indications for the individual operations are described at length, and the after treatment and results are considered.

The numerous illustrations are clear and descriptive. The index is well arranged, and the book is well printed.

This volume is a good beginning for the system, and promises well for those to come. J. S. D.

Orthopedic Surgery for Practitioners. By HENRY LING TAYLOR, M. D., assisted by CHARLES OGILVY, M. D., and FRED H. ALBEE, M. D., with 254 illustrations. 8 vo. 503 pages. (*D. Appleton & Company, 1909.*)

Dr. Taylor divides his book into general, special and technical parts. In his preface he says that he aims to give an outline of the essential facts in regard to deformities and crippling affections for daily use in general practice, which is a very good statement of what he does. There is certainly no redundancy and no unnecessary lengthy explanations. Most of the work is practical, theoretical discussions and explanations finding small room. The subject is presented in as brief a manner as is possible with clear explanations. The technical part is especially valuable to anyone who has to rely mainly on his own efforts and has not the advantage of hospital conveniences, and also to anyone who has not had the opportunity of much actual experience in the application of plaster splints and the various mechanical appliances which are essential in the work of orthopedic surgery. The illustrations are excellent and for the most part specially taken for this book. Dr. Taylor has had a large experience in this branch of surgery which enables him to write authoritatively. The book is modern and will be found valuable for students and practitioners, but does not excel in any special manner the other standard works on the subject. The author has appended the literature of the subject by modern writers for the convenience of those who desire fuller information on the subject.

HENRY W. KENNARD, M. D.

Appendicitis and Other Diseases of the Vermiform Appendix. By HOWARD A. KELLY, M. D. With 215 original illustrations, some in colors, and three lithographic plates. (*Philadelphia and London: J. B. Lippincott Company, 1909.*)

This work is not intended to replace the larger and more exhaustive first edition on the Vermiform Appendix and Its Diseases, by Kelly and Hurdon. But for the convenience of the busy surgeon the author has culled out of the larger book the essential and more important subject-matter, and has prepared this "compact résumé, dwelling with especial care on the practical side of the subject." The result is a handsome octavo volume of about five hundred pages, in which the author has exhibited admirable judgment and skill in his selective and eliminative treatment of the more pretentious first edition.

One not familiar with the earlier work would be apt to regard this epitomized edition as an exhaustive treatise, since it discusses the appendix from practically every standpoint at sufficient length to leave little to be desired.

As should be the case in a work designed for practical use among surgeons, chief space has been allotted the sections on Anatomy, Pathology, Etiology, Clinical History and Diagnosis, the Operative Treatment and Post-operative Care of the Patient and of Complications. These discussions are very full, comprehensive and clear. Of less practical significance, perhaps, but of absorbing interest, are the brief historical review of appendicitis, and the chapters on Bacteriology, Neoplasms, Specific Infections of the Appendix, the Medico-Legal Aspects of Appendicitis and others. The sections on Appendicitis and Typhoid Fever, Appendicitis in Childhood and Appendicitis in Gynecology and Obstetrics, deserve special emphasis because of the importance of every surgeon familiarizing himself with these associated conditions, now far too often going unrecognized until dangerous or fatal complications arise.

The same magnificent graphic illustrations by Brödel, Miss Huntington (now Mrs. Brödel), Horn and Becker, which, by reason of their superior artistic excellence, placed the former work in a class by itself, are profusely scattered through this new edition and add very materially both to the attractiveness and the worth of the volume.

In a word, the work is an authoritative treatise on the diseases of the vermiform appendix from every point of view, and deserves a place in the library of every practical surgeon. E. H. R.

A Text-Book of Operative Surgery, Covering the Surgical Anatomy and Operative Technic Involved in the Operations of General Surgery. Designed for Practitioners and Students. By WARREN STONE BICKHAM, M. D., Phar. M., Junior Surgeon Touro Hospital, New Orleans, etc. Third edition, greatly enlarged, containing 854 illustrations. Price $6.50. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

The book is divided into two parts, the first of which considers the operations of General Surgery, as follows: Operations upon Arteries; Veins; Lymphatic Glands and Vessels; Nerves, Plexuses and Ganglia; Bones; Joints; Muscles; Tendons and Tendon-Sheaths; Ligaments; Fascia and Bursæ; also Amputations and Disarticulations; Excisions and Osteoplastic Resections of Bones and Joints.

In the second part the operations of Special Surgery are taken up, in the following order: Spine and Spinal Cord; Neck; Thorax; Abdomino-Pelvic Region; Male Genital Organs; Female Genital Organs; and Operations for Herniæ.

The operative methods are well selected, graphically described, clearly illustrated, and cover the ground dealt with thoroughly.

The book is well constructed, and is up to date. All the subjects discussed are skillfully handled, and the work will be of value to anyone interested in operative surgery. J. S. D.

Surgery of the Upper Abdomen. In two volumes. By JOHN B. DEAVER, M. D., LL. D., Surgeon-in-Chief to the German Hospital, Philadelphia; and ASTLEY PASTON COOPER ASHHURST, M. D., Surgeon to the Out-Patient Department of the Episcopal Hospital, Philadelphia. Volume I, Surgery of the Stomach and Duodenum. With 76 illustrations, several of which are printed in colors. Volume II, in active preparation, Surgery of the Liver, Gall, Bladder, Pancreas and Spleen. (*Philadelphia: P. Blakiston's Son & Co., 1909.*)

This volume is valuable in that it brings together in a critical review all of the best work so far done on the Surgery of the Stomach and Duodenum. It also gives the results of these studies, as well as an expression of opinion based on these studies, and on the large personal experience of the authors.

The contents are as follows: Chapter I, Anatomy; II, Physiology of Digestion; III, General Diagnostic Considerations; IV-VI, Benign Diseases of the Stomach and Duodenum; VII, Hour-glass

Stomach; VIII, Benign Diseases of the Duodenum; IX, Benign Tumors of the Stomach and Duodenum; X, Miscellaneous Affections of the Stomach and Duodenum; XI, Malignant Diseases of the Stomach; XII, Malignant Diseases of the Stomach and Duodenum; XIII, Injuries of the Diaphragm, Stomach and Duodenum; XIV, Technique of Operations; XV, Complications and Sequels. Index of Names. Index.

Here and there through the book are short tables of valuable statistics, which are analyzed and discussed. There is practically no repetition in the text.

The discussion of the literature under the various headings is quite full, and the conclusions drawn are excellent. The descriptions are brief, but clear. The most important references are given after each subject.

The book is well printed, and the illustrations are satisfactory. This work will be useful to anyone interested in the surgery of the stomach and duodenum, and is well worth reading. J. S. D.

General Surgery. A presentation of the Scientific Principles upon which the Practice of Modern Surgery is Based. By Ehrich Lexer, M. D., Professor of Surgery, University of Königsberg. American edition edited by Arthur Dean Bevan, M. D., Professor and Head of the Department of Surgery, Rush Medical College, in Affiliation with the University of Chicago. An Authorized Translation of the Second German Edition, by Dean Lewis, M. D., Assistant Professor of Surgery, Rush Medical College, in Affiliation with the University of Chicago. With 449 illustrations in the text, partly in color, and two colored plates. (*New York and London: D. Appleton & Co., 1908.*)

The title, General Surgery, is the one in use on the continent in contradistinction to Special or Regional Surgery, and is somewhat misleading. However, the subheading fully explains the aim of the work.

The book is divided into seven parts and an idea of its scope can be obtained from the following summary:

Part I: 1, Wounds, Their Treatment and Repair; 2, Aseptic Technic; 3, General and Local Anæsthesia; 4, General Principles of Plastic Operations.

Part II, Wound Infections and Surgical Infectious Diseases: 1, Nature of Infections, Local and General Reaction; 2, Wound Infections Caused by Pyogenic and Putrefactive Bacteria and their Results; 3, Wound Infections of Different Origins and Surgical Infectious Diseases.

Part III, Necrosis.

Part IV, Injuries of Soft Tissues, Bones and Joints, and their Treatment: 1, Mechanical Injuries; 2, Chemical Injuries; 3, Thermal Injuries; 4, General Results of Injuries.

Part V, Important Surgical Diseases, Excluding Infections and Tumors.

Part VI, Tumors.

Part VII, Cysts, Not Including Cystic Tumors.

Appendix: 1, Direct Transfusion of Blood; 2, Opsonins, Phagocytosis and Therapeutic Inoculations of Dead Bacteria.

Dr. Bevan says in his preface, and very rightly, that there are certain general principles of pathology, therapeutics and operative technic which apply to all fields of Surgery, and where these are thoroughly mastered by the student or practitioner their application to special surgical conditions becomes at once intelligent, easy and scientific.

Many valuable additions to the original German edition have been made, and they materially increase the usefulness of the book.

In this volume all the subjects included in the above mentioned outline, are fully though concisely taken up. The illustrations are good, the references to the literature are plentiful and the book is well printed. It is without a doubt the most complete and up-to-date work now available in English, on the scientific principles upon which modern surgery is based, and is well worth reading.

J. S. D.

Abdominal Hernia: Its Diagnosis and Treatment. By W. B. DeGarmo, M. D., Professor Special Surgery (Hernia), N. Y. Post Graduate Medical School and Hospital, etc. (*Philadelphia: J. B. Lippincott Company, 1909.*)

This book, as its author states in his preface, is intended for the use of the general practitioner rather than the surgeon, and from this standpoint seems to fulfil in every way the purpose of the writer. The text is clear, the descriptions are good, and the illustrations are excellent and comprehensive.

The author starts with a brief but admirable description of the surgical anatomy of the various types of inguinal hernia. He devotes two-thirds of the volume to this type of hernia and covers the ground thoroughly and with a style which renders the work unusually interesting for one of its character.

The chapter devoted to the mechanical treatment of hernia is especially valuable. The different forms of trusses are here illustrated and the indications for the use of each are given. Instructions in regard to the proper fitting of such appliances and the precautions to be observed are fully set forth. The author, while he deprecates the mechanical treatment of hernia, recognizes the fact that many persons so afflicted will refuse operation, regardless of the advantages attending the more radical treatment. He is also aware that the majority of surgeons and practitioners know little or nothing about the proper fitting of a truss and in consequence turn the patient over to the instrument maker for further treatment. This division can be commended to both surgeon and physician.

The section on femoral hernia is brief, but good. Only one operation for correction is described or advocated: namely, the stitching of Poupart's ligament to the tissues overlying the ramus of the pubic bone, all these tissues being included in the four sutures necessary to close the opening.

In the cure of umbilical hernia an eliptical incision in the direction of the long axis of the body is recommended in which the umbilicus, the sac and any omentum which may be adherent are all removed in one mass, and after tying the neck of the sac the opening is closed by overlapping the abdominal wall. This manner of closing is stated to be superior to that of Dr. W. J. Mayo, who overlaps the abdominal wall in a transverse direction.

The less frequent forms of hernia receive brief mention.

The author has used original photographs and illustrations taken chiefly from his own patients while under treatment and based his conclusions as to form of treatment and operation largely upon his own personal experience with 1411 patients.

Constipation and Intestinal Obstruction. By Samuel G. Gant, M. D., LL. D., Professor of Diseases of the Rectum and Anus in the New York Post-Graduate Medical School and Hospital. Illustrated. Price $6.00. (*Philadelphia and London:* W. B. *Saunders Company.*)

Physicians as well as surgeons will be well repaid by a careful review of Dr. Gant's excellent book. Written in an easy style, concise and for the most part clear, the many points in diagnosis and treatment of this too neglected branch of medicine are taken up in logical order.

The indiscriminate use of enemata and drugs by both the laity and the profession is properly criticized and the necessity of cultivating regularity in evacuating the bowels could not have been better stated.

The value of the book would have been enhanced had there been added a chapter devoted exclusively to the proper examination of

the feces—macroscopic, microscopic and chemical. A more complete list of references, too, might well have been appended.

One cannot help wondering if due consideration has been given to the mental influence resulting from the use of the various mechanical devices, such as vibratory and electrical apparatus. And the same thought occurs to us on reading of the wonderful results following operative interference for constipation due to splanchnoptosis. One would hesitate to recommend this procedure for general use. The intestines can assume so many and various seemingly abnormal positions in perfectly normal individuals—especially is this true of the colon—that operative interference, except in cases selected with extreme care, can result only in additional misery. A careful study of Dr. Gant's reported cases ten years hence, might throw a great deal of light on this subject.

The author's severe condemnation of Whitehead's operation is not shared by the surgeons of all hospitals where in exaggerated cases of hemorrhoids, it is the operation of choice rather than of selection.

Many ingenious devices, both operative and mechanical, have been originated by the author and should prove of great value in this line of work.

The book is printed in a very legible type and is exceedingly well indexed. Bertram N. Bernheim.

Surgical Diseases of the Abdomen. With special reference to diagnosis. By Richard Douglas, M. D., formerly Professor of Gynecology and Abdominal Surgery, Medical Department, Vanderbilt University, Nashville, etc. Illustrated by 20 full-page plates. Second edition, revised and enlarged, edited by Richard A. Barr, B. A., M. D., Professor of Abdominal Surgery, Medical Department, Vanderbilt University, etc. (*Philadelphia: P. Blakiston's Son & Co., 1909.*)

There have been very few changes made in the book since its first edition.

The text indicates great familiarity with the literature, and the bibliography is very complete up to 1903. However, there have been no additions to these lists, as the latest reference is 1902.

J. S. D.

Medical Inspection of Schools. By A. H. Hogarth, M. B., etc. Price $2.00. (*London: Henry Frowde and Hodder & Stoughton.*) *Oxford Medical Publications.*

The recognition that children, taken over by the State for compulsory education, are often returned to their parents the worse for the experience is the real inception of modern medical inspection of schools.

Dr. Hogarth's book is an excellent presentation of what has been and ought to be done in this very important branch of State medicine.

He rightly defines medical inspection as more than an attempt to exclude contagious diseases or to point out obvious defects of the eyes, ears, nose and throat, but as a systematic overlooking of school life with regard to buildings and methods, with careful examinations of all children, normal and abnormal, sufficiently often to note defects and to devise means for correcting them when possible.

He emphasizes the fact that any system of education to be effective must be sufficiently elastic to reach alike the physically strong or weak—the mentally precocious or backward—and for results the physician and educator must work together harmoniously. The subject is considered from the point of view of the practical benefit to the community and State as well as the individual.

The book too is essentially practical, as to organization and administration—the duties and methods of the doctor and the nurse.

Brief reviews of the work done in various cities in this country and abroad are given and short descriptions of a number of common diseases affecting school life and their management.

He also describes school clinics which have been inaugurated in some cities abroad, to which children are referred by the inspectors and treated by specialists employed by the government.

While ideal, this seems hardly necessary in our cities, where excellent treatment is to be had at hospitals and dispensaries.

The book will be found useful to boards of education as well as doctors and nurses engaged in the work. R. A. U.

The Collected Papers of Joseph, Baron Lister, etc. Two volumes. (*Oxford: At the Clarendon Press.*)

These handsome volumes are a splendid memorial of the work done by Lord Lister. Here are presented all his most notable contributions, and it is such a list of important papers on various subjects as could not be equaled by any other living member of the profession. Here are his papers on Antisepsis, which will ever be associated with his name, and make it memorable as that of one of the great medical men of all times. There are other valuable articles on physiological, pathological and surgical subjects.

All that Lord Lister has written is well worth reading and it is to be regretted that these volumes are too costly for many who would be glad to own them. It would seem as though a cheap reprint would be most welcome.

Report to the Government of British Honduras upon the Outbreak of Yellow Fever in that Colony in 1905. By Rubert Boyce, M. B., F. R. S. (*London: Printed by Waterlow & Sons, Limited, 1906.*)

This report is well prepared and written, and will prove of interest to health officers and physicians living in our southern cities and throughout Central America, where outbreaks of yellow fever will still continue to occur from time to time. Dr. Boyce has made a thorough study of the problems associated with the existence of this fever in the town of Belize (Honduras) and the problems, and their solutions, are similar to those existing wherever yellow fever is found, and it is only by reiteration of well-known facts that the disease will be controlled more and more. The report is deserving of attention, especially as dealing with conditions in a small town where the doctors did not recognize the first cases.

The Faith and Works of Christian Science. By the writer of "Confessio Medici." (*New York: The Macmillan Company, 1909.*)

It is no secret that Dr. Stephen Paget, of London, is the author of the "Confessio Medici," a work that received much praise on its appearance and undoubtedly this attack on "Christian Science," as practiced by some of its followers, will have a warm reception. The author has studied both the Faith and Works carefully, and like many others finds little that is intelligible in the Faith, as expressed in Mrs. Eddy's works, and in the Works discovers far more harm than good. On the faithful followers of Mrs. Eddy this work will leave no impression—they will not waste their energies in refuting the attack—and to those who are already opposed to the Faith and its Works this new exhibition of its weakness and wickedness will appear unnecessary. Ridicule alone will kill this "new" religion—and no one as yet has appeared competent for the task. Every new serious study of Christian Science probably brings more adherents to the Faith than it takes away members. The less attention paid to it the better, or laugh at it, and sooner or later it will die a natural death. People will put up with any insult rather than lack of attention or ridicule. It is to be feared that Christian Science will outlive this last attack on its stronghold, and that Dr. Paget's good object will have little or no result.

BOOKS RECEIVED.

A System of Operative Surgery. By Various Authors. Edited by F. F. Burghard, M. S. (Lond.), F. R. C. S. (Eng.). In four volumes. Vol. IV: Operations upon the Female Genital Organs, Ophthalmic Operations, Operations upon the Ear, Operations upon the Larynx and Trachea, Operations upon the Nose and its Accessory Cavities. 1909. 8vo. 687 pages. Oxford Medical Publications. Henry Frowde, London; Hodder & Stoughton, London.

Studies in Paranoia. Periodic Paranoia and the Origin of Paranoid Delusions, by Dr. Nikolaus Gierlich, Wiesbaden. Contributions to the Study of Paranoia, by Dr. M. Friedmann, Mannheim. Translated and edited by Smith Ely Jelliffe, M. D. 1908. 8vo. 78 pages. The Journal of Nervous and Mental Disease Publishing Company, New York.

The Malarial Fevers, Hæmoglobinuric Fever and the Blood Protozoa of Man. By Charles F. Craig, M. D. Illustrated by four colored plates, twenty-five clinical charts and twenty-eight photomicrographs and drawings. 1909. 8vo. 477 pages. William Wood & Co., New York.

Third Report of the Welcome Research Laboratories at the Gordon Memorial College, Khartoum. Andrew Balfour, M. D., B. Sc., F. R. C. P. (Edin.), D. P. H. Camb., Director. 1908. 4to. 477 pages. Published for Department of Education, Sudan Government, Khartoum, by Baillière, Tindall & Cox, London.

The Collected Papers of Joseph Baron Lister, Member of the Order of Merit, Fellow and Sometime President of the Royal Society, Knight Grand Cross of the Danish Order of the Danebrog, etc. In two volumes. 1909. 4to. At the Clarendon Press, Oxford.

Metropolitan Asylums Board. Annual Report for the Year 1908. (11th year of issue.) 1909. 8vo. 302 pages. Charles Straker & Sons, Limited, London.

Report on Plague in the Gold Coast in 1908. By W. J. Simpson, M. D., C. M. G., etc., 1909. Fol. 55 pages. J. & A. Churchill, London.

Text-Book of Hygiene. A Comprehensive Treatise on the Principles and Practice of Preventive Medicine from an American Standpoint. By George H. Rohé, M. D., and Albert Robin, M. D. Fourth revised and enlarged edition. With many illustrations and valuable tables. 1908. 8vo. 582 pages. F. A. Davis Company, Philadelphia.

Naval Hygiene. By James Duncan Gatewood, M. D. Prepared by Direction of the Bureau of Medicine and Surgery, and Published by Permission of the Navy Department. With eight colored plates and 105 other illustrations. 1909. 8vo. 779 pages. P. Blakiston's Son & Co., Philadelphia.

Immunity and Specific Therapy. By W. D'Este Emery, M. D., B. Sc. (Lond.). With illustrations. 1909. 8vo. 448 pages. Paul B. Hoeber, New York.

Neurasthenia. By Gilbert Ballet. Translated from the third French edition by P. Campbell Smith, M. D. Illustrated with seven figures. 1909. 8vo. 408 pages. Paul B. Hoeber, New York.

The Sexual Disabilities of Man and their Treatment. By Arthur Cooper. 1909. 16mo. 148 pages. Paul B. Hoeber, New York.

The Open-Air Treatment of Pulmonary Tuberculosis. By F. W. Burton-Fanning, M. D. (Cantab.), F. R. C. P. (Lond.). Second edition. 1909. 12mo. 184 pages. Paul B. Hoeber, New York.

Protozoölogy. By Gary N. Calkins, Ph. D. Illustrated with 125 engravings and 4 colored plates. 1909. 8vo. 349 pages. Lea & Febiger, New York and Philadelphia.

Sprains and Allied Injuries of Joints. By R. H. Anglin Whitelocke, M. D., M. C. (Edin.), F. R. C. S. (Eng.). 1909. 8vo. 241 pages. Oxford Medical Publications. Henry Frowde, London. Hodder & Stoughton, London.

The Principles of Bacteriology. By A. C. Abbott, M. D. Eighth edition, thoroughly revised. With 100 illustrations, 26 of which are colored. 1909. 12mo. 631 pages. Lea & Febiger, Philadelphia and New York.

Manual of Chemistry. A Guide to Lectures and Laboratory Work for Beginners in Chemistry. A Text-Book Specially Adapted for Students of Medicine, Pharmacy and Dentistry. By W. Simon, Ph. D., M. D., and Daniel Base, Ph. D. Ninth edition, thoroughly revised. With seventy-eight illustrations, one colored spectra plate and eight colored plates representing sixty-four chemical reactions. 1909. 8vo. 716 pages. Lea & Febiger, Philadelphia and New York.

American Practice of Surgery. A Complete System of the Science and Art of Surgery, by Representative Surgeons of the United States and Canada. Editors: Joseph D. Bryant, M. D., LL. D. Albert H. Buck, M. D. Volume Six. Profusely illustrated. 1909. 4to. 916 pages. William Wood & Co., New York.

The Harvey Lectures. Delivered under the Auspices of the Harvey Society of New York, 1907-1908. By Professors Edwin O. Jordan, James Ewing and others. 1909. 8vo. 266 pages. J. B. Lippincott Company, Philadelphia.

Tuberculosis. A Treatise by American Authors on its Etiology, Pathology, Frequency, Semeiology, Diagnosis, Prognosis, Prevention and Treatment. Edited by Arnold C. Klebs, M. D. With three colored plates and two hundred and forty-three illustrations in text. 1909. 8vo. 939 pages. D. Appleton & Co., New York and London.

Practical Dietetics. With Special Reference to Diet in Disease. By W. Gilman Thompson, M. D. Fourth edition, illustrated, enlarged and completely rewritten. 1909. 8vo. 928 pages. D. Appleton & Co., New York and London.

THE JOHNS HOPKINS HOSPITAL BULLETIN.

The Hospital Bulletin contains details of hospital and dispensary practice, abstracts of papers read, and other proceedings of the Medical Society of the Hospital, reports of lectures, and other matters of general interest in connection with the work of the Hospital. It is issued monthly.

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PLEURAL AND PULMONARY SECONDARY OSTEO-SARCOMAS.

By E. R. LeCount, M. D.

(From the Pathological Laboratory of Rush Medical College, Chicago, Ill.)

The effort Virchow made in his account of bone tumors[1] to separate the benign from the malignant more definitely than had been done before, is the chief impression to be gained from its reading. The care with which he sought literature for illustrative cases is additional evidence, were any needed, that clear notions of what constituted an osteo-sarcoma, or in other words which of the growths from bone were to be feared the most, were not prevalent at that time. A few years previously Müller[2] had designated as "osteoid" certain tumors of the periosteum and collected and supplemented the reports dealing with them. Virchow emphasized their malignancy too and cited as examples, and with some detail, those described by Weber,[3] Wilks,[4] Fergusson and Beale,[5] Sedgwick,[6] Rokitansky,[7] Birkett,[8] Stanley[9] and Paget.[10]

Cancer of the bone (*Knochenkrebs*) was still considered as different from bone sarcoma, nor was this misconception dispelled by Virchow. He was similarly earnest in pointing out the malignant features of the myelogenous sarcomas. To the reports by Gerlach,[11] Hutchinson,[12] Foster,[13] Henry,[14] Cock and Wilks,[15] Lebert,[16] Grohe[17] and Weber,[18] he added one personal observation. Several of these dealt with the so-called myeloid or giant-celled sarcoma the relative benignancy of which seems to have been as greatly debated then as it is now.

In Broca's contemporaneous work the context indicates even more clearly that the dissemination of these tumors was to some degree a mooted question. In addition to mentioning that several museums contained preparations to substantiate his assertion that metastasis does occur, Broca[19] refers to two previously reported observations of secondary and distant growths from *"tumeurs purement osseuse."* One of these citations is of considerable historical interest and serves to denote the comparative ignorance then (1793) prevalent in regard to the metastasis of tumors; it is the following statement by Ballie:[20]

[1] Die krankhaften Geschwülste, Berlin, 1864-1865.
[2] Müller's Archiv, 1843, 396.
[3] Cited by Müller.
[4] Guy's Hosp. Rep., 1857, 3d Series, 3, p. 156.
[5] Tr. Path. Soc., London, 1853-1854, (5), 321.
[6] The British and Foreign Med. Chir., Rev., 1855, (31), 158.
[7] Wchnbl. d. k. k. Gesellsch. d. Aerzte in Wien, 1857.
[8] Guy's Hosp. Rep., 1857, 3d Series, 3, p. 338.
[9] A Treatise on Diseases of Bones, 1849, London and Philadelphia, 143.
[10] Lectures on Surgical Pathology, London, 1863, p. 506.
[11] Ztschr. f. rat. Med., 1847, (6), 377.
[12] Tr. Path. Soc., London, 1857, (8), 346.
[13] Ibid, p. 389.
[14] Ibid, 1858, (9), 367.
[15] Med. Times and Gaz., 1859, (1), 70.
[16] Traité d'anatomie pathologique, 1857-1861, Paris, 194.
[17] Lehrbuch d. chir. Operationslehre, A. Bardeleben, 1863, I. 566.
[18] Chirurgische Erfahrungen (etc.), 1859, Berlin, 364.
[19] Traité des Tumeurs, Paris, 1866, I, p. 291.
[20] The Morbid Anatomy of Some of the Most Important Parts of the Human Body, 1820, Phil., 3d American Edition, 48.

Part of the lung is occasionally converted in a bony substance, but this is a rare disease . . . . In the only instance which I have known of this complaint the process would appear to have been rapid. There was great difficulty of breathing before the person died, but this difficulty had only been for a very few weeks. Each of the lungs was undergoing the same change of structure which had made considerable progress. In the particular case to which I allude there had been a very strong disposition to form bone in the constitution. A very large bony tumor had been found round one of the knees of this person; and very soon after the knee and leg were removed by amputation, the difficulty of breathing began, which was occasioned by a part of the lungs being converted into bone.

That secondary tumors from those primary in bones occur in the lungs and more frequently than from tumors elsewhere have now long been matters of common knowledge. Many of the observations which, supplementing the work of Virchow, helped to definitely establish these facts were collected by Gross,[21] and another summary was made in the following year, 1880, by Schwartz.[22] At present surgical literature contains many other statistical contributions to this subject which include among other data, the relative frequency of metastasis and other facts connected with its occurrence bearing upon the prognosis. During the last fifteen or twenty years such articles have been especially numerous; many are based upon cases treated at some particular clinic or according to some special surgical procedure;[23] in fact the development of knowledge concerning bony tumors since Virchow's work appeared has been notably in the practical phases indicated, of diagnosis, treatment and prognosis. Some minor embellishments, such as placing the "bone cancers" with osteo-sarcomas, for example, and additions to the finer histological structure of osteo-sarcomas in general have been made, but to a very large degree the morbid anatomy of the tumors of bone including both the primary and secondary growths is as Virchow left it.

Through the kindness of Dr. Warren H. Hunter,[24] I recently had opportunity to study an extensive metastasis of an osteo-sarcoma in the lungs and pleura. By this examination and a review of reports of other somewhat similar lesions, I have been impressed with the interesting relations these secondary growths may occasionally have for both clinical medicine and surgery, but still more by the unusual features malignant tumors of the bones may occasionally manifest, features exceptional for even such widely diversified phenomena as result from tumor growth generally. The investigation of malignant tumors in recent years has been largely directed to questions of growth, transplantability and other problems of perhaps broader biological nature than the search for a parasite which in spite of the persistent endeavors of many has as yet proven so fruitless.

The osteo-sarcomas with their secondary growths possess many relations to this more recent direction of investigation, indeed the continued growth of transported tumor cells resulting in metastatic tumors may depend upon factors quite identical with those responsible for the successful transplantation of spontaneous tumors of animals. These statements pertain equally well to a few other malignant tumors not ordinarily thought of as either carcinoma or sarcoma, for example the hypernephromas, chorioepitheliomas and the thyroid growths which are so prone to produce secondary tumors in bones.

For these various reasons it will not perhaps be deemed untimely to report with some detail the results of the examination of the intrathoracic secondary growths received from Dr. Hunter together with some considerations they have given rise to.

As interesting perhaps as any other result was the realization of the inadequacy of accounts of bone tumors, especially the text-book descriptions, in dealing with the secondary growths; there is in them so little to prepare the student for conditions other than those commonly met with. The reasons for this may be many, but certainly when Virchow wrote the chapter on Sarcoma,[25] there was greater need, as already mentioned, of a better understanding of what bone tumors were malignant than of exceptional anatomical features of these tumors or their secondary growths.

The examples of secondary growths in the lungs and pleural membranes which he cited from literature as well as those he selected from his own experience[26] represent, with a few exceptions to be noted presently, the usual conditions still described in the incomplete accounts given in text-books. The characteristics of these secondary growths in all but a few of the cases he used to illustrate metastasis are briefly as follows: Multiple nodular masses often consisting in part of cartilage or bone, predominating in the right lung as a rule, mostly near the surface of the lungs, varying in size from miliary tubercles to apples and showing a disposition to flatten out toward the pleural surface. Although some deviation from this general description exists in some of the accounts he utilized—cases reported by Cock and Wilks[27] and by Grohe[28]—the greatest departure occurs in an observation Virchow himself contributed.[29] This dealt with a soft, velvety, bloody growth covering the entire right lung and very thick on the pleura covering the diaphragm on that side, with compression of the right lung by about two quarts of a thick

[21] Am. J. M. Sc., 1879, 78, 1 and 338.

[22] Des Ostéosarcomes des Membres, Thèse, Paris, 1880.

[23] See in this regard the works of Fischer, Deutsche Ztschr. f. Chir., 1881, (14), 468; Krause, Arch. f. klin. Chir., 1889, (39), 482; Nasse, ibid, 1889, (39), 886; Borck, ibid, 1890, (40), 941; Wiesinger, Deutsche med. Wchnschr., 1898, (42), 668; Ziegler, München. med. Wchnschr., 1895, (42), 621; Reinhardt, Deutsche Ztschr. f. Chir., 1898, (47), 523; Pollosson and Bérard, Gaz. hebd. de méd. et chir., 1899, (46), 985; Werner, Statistischer Beitrag zur Therapie der Unterschenkelsarkom, I.-D., Erlangen, 1901; Kramer, Arch. f. klin. Chir., 1902, (66), 792; Jenckel, Deutsche Ztschr. f. Chir., 1902, (64), 66; Kocher, Beitr. z. klin. Chir., 1906, (50), 118; Haberer, Ztschr. f. Heilkunde, Abth. f. Chir., 1906, (27), 100.

[24] Coroner's Physician.

[25] L.c. Vol. II, 19th lecture.

[26] Numbering from both sources all together 23.

[27] L. c.

[28] L. c.

[29] L. c. II, 339.

bloody fluid; a similar involvement of the pleural layers of the left side which were, however, adherent in places, and scattered tumors in the left lung, one as large as an apple. From his account of the illness in this instance it seems that the metastasis to the pleural surface of the lungs must have taken place when the primary tumor, which was in the foot, was still very small. The patient suffered great thirst, very marked orthopnœa without cough or expectoration. Similar extensive growths as either soft or more bony coverings of the lungs have been noted since, but not frequently. The description by West [30] of soft fleshy vegetations covering the compressed right lung, secondary growths from a primary tibial sarcoma, certainly pertains to a condition much like that depicted by Virchow. The following account of Pitts [31] is worth quoting in full:

> The sternum and costal cartilages were found to be intimately adherent to the pleura on the left side and only removed with difficulty. On their removal it was seen that the left pleura was greatly thickened and of a stony hardness and intimately adherent to the thoracic wall, to the diaphragm and to the pericardium. On its removal with the lung it formed a complete cast of the cavity of the left side of the chest. The right pleural cavity was nonadherent and free from new growths. These growths are found in relation with the branches of the pulmonary artery and vary greatly in size; they are very numerous. The surface of the right lung was covered with nodules, umbilicated and of a stony hardness. On section there were strands of new growth running along the connective tissue of the lung, which was resonant on percussion. No other evidences of growth were found.

The clinical history given by Pitts is also indicative of an early metastasis. Following a sprain of the wrist there was two years later slight increase of its circumference which with the enlarged glands at the elbow and axilla were supposed to be inflammatory. An exploratory incision was made of the swelling at the wrist. Two weeks later tumors were found in the leg and thigh, but a tumor growth at the wrist was not suspected until a week later and a few days before three pints of bloody fluid were removed from the left chest; one month later death occurred. The tumor of the wrist proved to be a periosteal tumor. D'Arey Power also reported to the London Pathological Society [32] plate-like masses of bone in the pleura of the right lung from a tumor of the knee. The lungs were very adherent to the chest walls and doubtless prevented the accumulation of a sanguinous transudate and compression atelectasis. Chifolian and Laignel-Lavastine [33] have reported a diffuse peritoneal sarcomatosis accompanying a diffuse involvement of the pleura with compression of the right lung, lesions secondary to a very bloody osteo-sarcoma in the outer condyle of the lower end of the humerus.

The form of the metastasis in the organs I examined was of the same variety, diffuse involvement of the pleura for the most part. They were removed from the body of a young unmarried Italian woman (C. P.), age 21, who entered the Cook County Hospital on December 4, 1907, in the surgical service of Dr. Humiston. She was in a dying condition. A thoracentesis had been performed by removing a portion of the 7th right rib and a fistula existed at this point. Her abdomen and extremities were swollen, there were numerous regions of dulness over the lungs, and breathing was labored. It was thought that she was in the last stages of tuberculosis of the lungs with an empyema of the right side, and before a thorough examination was made death occurred, nine hours after admission. At the post-mortem examination, conducted by Dr. Hunter, a remarkable and extensive formation of bone was discovered in the pleural cavity. So far as could be learned the conditions in the thorax were responsible for most of the symptoms and had chiefly interested a number of physicians through whose hands she had passed; moreover, they were of such an exceptional nature that at the post-mortem examination a careful search for related lesions was omitted: neither clinically nor at the post-mortem examination was the real nature of the disease ascertained.[34]

Macroscopic Description.[35]—The right lung (see Fig. 1) is scarcely as large as a good sized fist. It is 11 cm. vertically, 7 cm. through the greatest anterior-posterior, and 4.5 cm. through the greatest transverse diameter. It is flattened toward the median line and covered with a hard newly-formed coating which has fixed and helped to suspend it in the pleural cavity. Between it and the right leaf of the diaphragm which is similarly involved the hand may be inserted edgewise. This new covering of the lung is reflected over such portions of the parietal pleura as are present, viz., that covering parts of the pericardium externally and the right leaf of the diaphragm.[36]

This coating is a dark reddish color; it is covered here and there with bits of yellowish fibrin in thin sheets and flaky masses. For the most part it is of bony hardness and beset with rounded elevations which have coalesced in many places and vary greatly in diameter, 2 mm. to 3 cm. Near the tendinous portion of the right half of the diaphragm there are two such bosses 1 and 2 cm. in diameter, respectively, and elevated 1 and .5 cm. from the general level. Just external to these the diaphragm is folded somewhat there being on its under surface a saggitally directed furrow 4 cm. long, and corresponding to this on its upper surface a long oblong elevation. The sole-leather-like consistency of the diaphragm indicates that this fold has existed for some time. It would be impossible to smooth it out now. The nodules are less marked on the lung, but from the lower border and in front there are two projecting downward nearly as large as those on the diaphragm, one of them nipple-shaped, the other not as prominent, but larger with bifurcated apex (Fig. 1).

From the diaphragm this new covering extends upward covering the outside of the pericardium where this structure faces the right pleural cavity and although the pericardium is smooth within, it is hard and board-like in its firmness and irregular within from the growths in its outer layers, of the nodules in the overlying pleura.

After cutting away the outer half of the right lung with a saw

[30] Tr. Path. Soc., London, 1884, (35), 84.
[31] Tr. Path. Soc., London, 1886, (37), 374.
[32] Transactions, 1889, 40, 293.
[33] Bull. Soc. Anat. de Par., 1900, (75), 575.

[34] The lower extremities were œdematous and masked the enlargement of the upper end of the right tibia where the primary tumor was located.

[35] These secondary growths were demonstrated at the meeting of the American Association of Pathologists and Bacteriologists in Ann Arbor, 1908.

[36] The entire costal pleura was similarly altered according to Dr. Hunter.

(Fig. 2) the extent to which the new formation of bone in the pleura has increased the weight of the structures becomes very apparent, for holding the outer half of this lung in the hand reminds one of a large shell or the half of a cocoanut in its weight and consistency. Where this vertical saggital section cut across the bony covering to the lung there is exposed a remarkable similarity to the tables of the skull as they appear when cut across in removing the calvarium, especially is this true of the covering for the posterior part of the lung. Here the lung has been covered by two tables of bone, yellow on their cut surfaces with a distinct marrow between them, resembling diploë (*c* and *C*, Fig. 2). For a distance of 7 cm. this vertical saggital section exposes such a coating and for the same distance it is quite uniformly 1 cm. in thickness. The likeness to the tables of the skull is increased by the evenness and regularity of the inner surface facing the lung; its section forms quite a straight line. The outer surface is more irregular. The inner of these two tables is 1 mm. thick, the outer 2 mm. Between the two tables there are connecting bridges of bone at intervals, separating in some places red marrow, in others yellow. In this single section the bony covering is thinner than elsewhere. Passing upward over the apex from behind where these two tables occur, the layer of bone over the apex varies from 4 to 5 mm. in thickness and on the anterior surface it diminishes slightly in thickness downward, but on the whole its regularity and rather uniform appearance is quite remarkable.

The existence of two tables only occurs behind.[37] In front, and at points corresponding to the location of the interlobar fissures in such a small and compressed lung, there are exposed by this section two extensions from the outer bony shell into the lung. The lower is 3.5 cm. long, the upper slightly shorter; both are made up of compact bone and 4 mm. in width quite uniformly. Except for a few small discrete nodules near the apex, bone does not appear within the lung at other points on either of the two surfaces exposed by this single section. The bronchi where cut across, as well as the cartilages of the larger ones, show no alterations. None of the discrete nodules mentioned are connected with bronchial cartilages. The parenchyma of the lung is dark red and in the fresh condition apparently would have been crepitant.[38]

The left lung appears slightly smaller than normal, but it has evidently suffered no compression from fluid in the left pleural cavity. There are fibrous adhesions on the upper and outer part torn in removal of the organ and partly covering the flat, thin button-shaped growths, cartilaginous or horny in consistency, which are found in a large part of the exterior. These are not on the pleura, but within and beneath it. Where they are larger their subpleural location is more apparent. At the margins, especially the lower outer angle of the lung, the flat nodules extend through the lung so as to present on both the outer and diaphragmatic surfaces. Their size varies. Some are 1 to 2 mm., some 3 to 4 cm. in diameter as measured on the exterior of the lung. The small ones seem to contain a hard kernel, the enveloping tissues being softer and yet firmer than the adjacent lung tissue. The largest nodule is in the anterior margin of the upper lobe lying over the base of the heart and when sectioned (with a bone saw) the surfaces exposed possess all the characteristics of a rather close-meshed cancellous bone with red marrow in the interstices. This nodule is 4 cm. long and 2.5 cm. in thickness. Its external surfaces are even with the two surfaces of the lung in this situation and the primary location was apparently on the inner or mesial surface of the auricular lobe, from whence growth occurred forward, for the inner mesial surface is broad and flat, the other presenting on the anterior surface of the lung is irregular with deep indentations between the rounder projections. This is a solid mass and has replaced all the lung tissue in the district occupied. Several similar, but smaller, nodules occur along the posterior margin of the lung, that surface lying in the vertebral groove; some are 2 cm. in diameter, all are relatively thin and flattened out against the external surface.

In front of the aortic arch and opposite the beginning of the innominate artery, there is a lymph gland as large as a hickory-nut (2 cm. in diameter) roughly spherical and hard as eburnated bone. After sawing off a little of the outside the underlying tissue is yellow and possesses every resemblance to quite compact bone. There are regions of coal pigment in this bone. The lining of the trachea and larger bronchi is smooth and unchanged. The heart has no noteworthy changes.

That the foregoing account is descriptive of a secondary osteo-sarcoma in the lungs and especially the pleura, notwithstanding failure to demonstrate the primary tumor at the post-mortem examination, was rendered highly likely by the facts learned concerning C. P. previous to her entrance to the Cook County Hospital. She entered the Columbus Hospital, Chicago, in the service of Dr. W. P. Verity, four months before her death, for trouble with her right knee, thought to be "white swelling." Fluid was discovered in her chest and this was removed several times during the six weeks she remained there, a diagnosis of hemorrhagic pleuritis, probably tuberculous, being made. Nine weeks before death she returned to her home and was found to be suffering again from impeded respiration by Dr. G. F. Schreiber,[39] who removed half a gallon of a non-purulent fluid from the right pleural cavity and a few days later a gallon. He then inserted a tube into this cavity through an opening made by resecting a portion of the seventh rib. The tube remained in the cavity for three weeks, according to Dr. Schreiber, and as previously stated when admitted to the County Hospital a fistula was still present at this point. Dr. Schreiber considered the knee trouble tuberculous synovitis and the thoracic involvement an empyema of the same nature. He was unable to learn of any other tuberculosis in the family and he strongly urged an Estlander operation to close up the empyema cavity. In his letter to me he refers to a tuberculous abscess in the gluteal region and to having experienced no difficulty in the thoracentesis or the resection of the rib in entering the chest wall.

In addition to the support received from these few clinical details, there was—for considering these bony intrathoracic growths as secondary tumors—the additional reason that their gross characteristics were not those of either the primary stalacite osteomas of the lung,[40] or the primary tumors of the bony thorax.[41] Nor was there any resemblance in these extensive changes found in the lungs to the comparatively small masses of bone in the lung described by Pollaek[42] and explained by him as a metaplasia phase of the cicatrization about coal deposits and necrotic tissue. These various reasons were all justified by procuring the primary tumor one year after

[37] Further sectioning was not done on account of the museum value of the material.

[38] It was hardened before being sectioned.

[39] To whom I am indebted for most of the clinical history.

[40] See the review of these by Arnsperger, Ziegler's Beiträge, 1897, (21), 141.

[41] Quénu and Longuet, Rev. de Chir., 1898, (18), 365.

[42] Virchow's Archiv, 1901, (165), 129.

burial.[43] Only the upper part of the body had been affected by the embalming fluid and post-mortem changes were in spite of the embalming, far advanced.

The tumor in the upper end of the tibia (Figs. 3 and 4) envelopes the upper end of the bone as a sheath of stony hardness which in places rise 2 to 4 mm. higher than the articular surfaces for the femur condyles. This sheath is fairly uniform in its disposition and thickness. It fills the cavity below the head where the head joins the shaft in such a manner that the circumference 3 cm. below the upper end of the bone is 24 cm. (the normal is about 15 cm.) and 7.5 cm. below the upper end the circumference is 21 cm. (normal about 10.5 cm.). A little lower this sheath of adventitious bone ends rather abruptly by curving almost horizontally inward to the shaft which below this point is normal externally; the entire length of the bone so ensheathed is 10 cm. of the upper end. The exterior of the growth is nodular in front and more flat behind, the coalescent nodules in front are as large as the ends of hen's eggs. Small particles of bone are readily detached from the outer surface and the impression that the growth has taken place from the periosteum outward as projections which have become closely set together is increased by an appearance behind where running upward from the inner margin of the shaft across the head of the bone there are parallel markings like the veins which mark the stratification of superimposed layers of stone in a ledge or outcropping. Here the appearance suggests that the growth has occurred as parallel sheets of bone growing outward from the shaft. Below and externally there is a defect in this sheath which appears as though a round blunt instrument had been driven through it from before backward and a little downward. The two terminal phalanges of the little finger fill this defect completely and its walls are rough, irregular and composed of fine trabeculæ which look broken.

Above as already stated this sheath of bone rises higher than the articular surface. It surrounds the upper end of the bone so that viewed from above, the end of the bone has a zone of tumor all about it, but this zone is markedly thicker and more abundant on the front and inside of the articular surface for the inner condyle of the femur where it measures 1 cm. in thickness directly in front diminishing gradually backward. It fills in the notches between the articular facets both in front and behind, and in front there are thin extensions of the tumor growth over both articular surfaces. That over the external facet extends inward from 3 cm. of its antero-internal margin, a maximum distance of 6 mm.; that on the inner facet is roughly circular, 5 mm. in diameter and located near the inner margin; for the remainder the articular surfaces are unaltered. The fibular facet too, is unchanged although it is so surrounded by the sheath of bone that it is a smooth, flat bottom for a shallow pit. The head of the fibula is normal.

When sectioned vertically by sawing saggitally the surfaces exposed are like the exterior, hard and bony throughout (Fig. 4). On these surfaces the cortex of the former shaft, apparently but little altered, is visible the entire length of the surfaces. The bone which has grown about the tibia measures 2 cm. behind and 17 mm. in front, the maximum thicknesses measured from the outside of the cortex. Many of the trabeculæ of the former normal cancellous bone in the head of the tibia are also visible on the surfaces. The medullary cavity, the outer sheath and the spaces in the cancellous bone of the tibial head are all filled with bone with meshes so fine and regular that even with a hand lens it is uniformly and finely granular. The markings of outward growing trabeculæ and spiculæ from the shaft which were expected are entirely absent, in fact the appearance of these surfaces in its evenness is not very unlike that which would be found had a wax cast of the growth been sectioned. How far down the marrow cavity was filled by the bony growth is a matter of conjecture since only the upper end of the tibia, as shown in Figures 3 and 4, was obtained.

[43] Great credit is due Mr. Hoffman, Coroner of Cook County, for his aid in securing consent of the relatives for an exhumation.

The secondary growths in the lung and pleura produced by metastasis from this bony growth in the tibia, are quite like those presented in the reports by Virchow, West, Pitts, D'Arcy Power, Chifolian and Laignel-Lavastine in the large amount of surface of the lung involved by the coalescent secondary growths, in the compression of the lung by a bloody transudate and in the formation of bone in the secondary growths. Not all of these features were present in each instance, for example as already has been stated the diffuse growth on the pleuræ described by Virchow was soft and velvety, in the right pleura of C. P., the young Italian woman, there was a diffuse bone formation; the report by D'Arcy Power deals with plate-like masses of bone. Whatever the variations, these pleural metastases should be associated as one group or form of secondary growths possessing as a common characteristic the disposition to result in an involvement of the pleuræ which may be referred to as diffuse, although it is without doubt in most instances disseminated at the beginning, the large amount of pleural surface involved being due to the subsequent coalescence of adjacent nodules. The term pleural may also be open to some criticism for in all liklihood the process is essentially subpleural, at least in part, and consists of a spreading out or flattening of the nodules by growth of the tumor cells in the subpleural lymph channels.[44]

In this connection reference may be made to the diffuse "chondro-myxo-sarcoma" which is definitely placed in the literature as a primary growth of the pleuræ by Busse,[45] in a report which includes no mention of the bones other than those of the thorax. In view of the early metastasis which occurs not infrequently with osteo-sarcoma[46] his explanation of its origin from the pleura is not likely to satisfy the critical reader; there is considerable similarity between the tumor he has described and secondary growths of the same nature as they occur in the pleura.[47]

An entirely different condition and one resulting at times in at least some clinical differences, for example the failure to obtain fluid on thoracentesis, is produced by the pedunculated secondary pleural growths from tumors of bone.[48] The cases

[44] Lobstein—Lehrb. d. path. Anat., Stuttgart, 1834, I, 371—observed a soft pleural metastasis made up of coalescent nodules from a tumor of the hand, but the exact origin of the primary tumor is not evident from his account.

[45] Virchow's Archiv, 1907, (189), 1.

[46] This term osteo-sarcoma is used throughout this article as referring to a malignant tumor originating from bone.

[47] Since the foregoing was written, Busse's contribution has been rather severely dealth with by Ribbert—Virchow's Archiv, 1909, (196), 341—who believes that the growth described by Busse originated in the lung.

[48] Craigie mentions the "numerous pendulous and sessile tumors" of the pleuræ in connection with fungus hematodes (Elements of General and Special Pathological Anatomy, 1828, Edinburgh, 742).

reviewed by Virchow contained one instance of this form of metastasis in the observation by Cock and Wilks[49] of a pedunculated secondary tumor of the pleura the size of the heart. In the examination of the body of a boy, 15 years old, whose leg had been amputated for a tibial sarcoma by Dr. F. A. Besley,[50] eleven months before death, I found remarkable examples of these pedunculated growths in each pleural cavity. On the right side[51] there was one larger than the normal pleural cavity for this age, 15 years, and by it the heart was pushed to the left, its right border being opposite the left border of the sternum. This large mass had become loosened from its original pulmonary attachment and was planted sessile on the costal pleura; two large separate growths on the left side were pedunculated, the larger being attached by a remarkably slender pedicle. There were also growths within each lung. These intrathoracic tumors had pushed the liver down so that its upper border lay opposite the costal arch. Considering the large amount of tumor tissue in the thorax the symptoms were not of great severity.

There are several interesting variations from the usual textbook descriptions of the *intrapulmonary* tumors resulting from the transportation and location there of the cells of bone tumors. One is in the large size the growths in the lung may attain. In one of the two remarkable cases reported by Birch-Hirschfeld,[52] there was an enormous secondary tumor in the right lung pushing the diaphragm down and extending upward to the third rib; on the left side there was another large mass which grew through the diaphragm and formed below in contact with the spleen a nodule the size of a fist.[53]

Kuster[54] reported, from a femur sarcoma, secondary tumors in the thorax which on the right side grew through the diaphragm and on the left produced a mass the size of a child's head. Allin,[55] mentions "an immense deposit at the base of the lung" secondary to a humerus sarcoma; many of the smaller secondary tumors in the lungs were hard. In the left side of the chest of a 15-year-old girl and from a femur sarcoma, Meakin[56] states there was found "a large mass occupying the whole of the left side of the chest with the exception of a small space above the level of the second rib. It appeared to have replaced the whole of the left lung with the exception of the extreme apex." Other exceptionally extensive replacements of the lung tissue by these secondary tumors are reported by Durham,[57] Bösch[58] and Rose.[59]

It is of great clinical value to remember that not only the observers of these large secondary intrapulmonary tumors, but also those who have met with the enormous pedunculated intrapleural growths have quite uniformly commented upon the disparity between the size of the secondary tumors—the large amounts of the thoracic cavity they occupy—and the relatively few symptoms they produced. This was also noted many years ago by Albers.[60]

Reference has already been made to the nodules in the lungs in C. P. containing hard masses in their central portions. The bone was produced in the centers as the histologic examination demonstrated. Many reports contain references to a similar structure for the secondary tumors in the lungs or pleuræ, in fact it would seem to be by no means unusual.[61] On the other hand there are accounts of similar secondary tumors, osteo-sarcomas, with the bone formed on the outside. One of the reports Virchow used, that by Birkett,[62] concerned such metastases. Birkett states that "some were softened in the center and reminded one of the hollow in the original growth from the arm," and Wilks[63] in discussing these same secondary growths that they were "surrounded by bony shells composed of true osseous structure." Jackson[64] mentions as the largest secondary growth in the lungs a filbert-sized nodule in which "the outer part only was hard forming a shell around the softer interior." Perhaps the best example of this disposition of the secondary tumor to reproduce in the lungs this feature of the primary tumor, for this is indeed the process, is to be found in the oft-cited report by Oberst[65] dealing with the metastasis of a central giant-cell sarcoma of the lower end of the femur. In both lungs were many pea- to walnut-sized secondary tumors, most of them soft and full of blood; some had ruptured during life and in the right pleural cavity were 2.5 liters of bloody fluid; some of the larger tumors had about them a thin shell of bone (*schalige Sarkom*).

There is not much reason to doubt the essential similarity of the process described by Fagge[66] although he mentions no bone on the outside of the nodules. Not all of the secondary tumors in the lungs Oberst observed had bone about them. Fagge's report concerned mainly the purpura hemorrhagica associated with multiple sarcomas following a femur sarcoma. "In the lungs there were five or six scattered secondary nod-

[49] L. c. See also Tr. Path. Soc., 1858-1859, (10), 244. Also the illustration of the museum specimen in Cathcart, "The Essential Similarity of Innocent and Malignant Tumors," Bristol and London, 1907, p. 34, Case 9.

[50] The primary tumor is described in Surg., Gynec. and Obstet., 1905, (1), 412.

[51] See the description by Dowling, Surg., Gynec. and Obstet., 1907, (4), 153.

[52] Arch. d. Heilkunde, 1869, (10), 468.

[53] The description by Chaissaignae—Gaz. d. hôp., 1856, (29), 442—of a very large secondary tumor in the chest, from a primary tumor of the ankle should probably be considered as a large intrapulmonary secondary osteo-sarcoma although Virchow uses this report to illustrate "parosteal tumors."

[54] Arch. f. klin. Chir., 1870-1871, (12), 630.

[55] Med. Rec., 1878, (13), 116.

[56] Tr. Path. Soc., London, 1895, (46), 33.

[57] Tr. Path. Soc., London, 1883, (34), 265.

[58] Ueber einer Fall von Osteosarkommetastasen der Lunge, I.-D., 1889, Würzburg.

[59] Deutsche med. Wchnschr., 1890, (16), 913.

[60] Erläuterungen zu dem Atlasse der pathologischen Anatomie, 1833-1846, Bonn, III, 418.

[61] Virchow, Deutsche Klinik, 1858, (10), 481; also Hillier, Trans. Path. Soc., London, 1855, (6), 317.

[62] L. c.

[63] Guy's Hosp. Rep., 1857, 3d Series, III, 158.

[64] Tr. Path. Soc., London, 1866, (17), 209.

[65] Deutsche Ztschr. f. Chir., 1881, (14), 409.

[66] Guy's Hosp. Rep., 1881, 3d Series, (25), 1.

ules which repeated in a striking manner the characters of the primary growth. They were of a reddish color and projected above the level of the rest of the surface. But they felt quite soft and when they were cut into a quantity of blood squirted out of them and they collapsed." Adams [67] also observed such metastases.

A fifth variation to the appearances of the intrathoracic secondary tumors from the location of tumor cells in the respiratory circulation, is due to the growth of tumor tissue in the pulmonary artery and its branches. The records of this occurrence which I have been able to find have concerned mainly enchondromas, tumors for many years supposed to be strictly limited in their growth, and especially the large enchrondromas of the pelvic girdle or the shoulder bones. To limit consideration of these intravascular growths to the vessels within the lungs would give but a limited notion of the process. It is common knowledge that a tumor originating from bone is disposed to grow into the blood vessels when it acquires features of malignancy, but why the most remarkable of these intravascular and intracardiac growths should be from tumors composed chiefly of cartilage is difficult to state; the assumption that they result from the production of an intercellular substance—the ground substance of cartilage—which does not readily disintegrate so as to allow of the loose-cell embolism common to osteo-sarcomas in general, is obvious and probably in some measure justifiable. The old and now quaint account by Cheston [68] of a continuous growth of cartilage which filled the thoracic duct to distension associated with multiple chondromas of the lungs, both resulting from a large enchondroma of the pelvis should be registered with the intravascular growths.[69] In Paget's report of the metastasis following a similar growth the process of intravascular extension is thus described: [70] "The lower lobe of the right lung was hollowed out into a large sac, containing greenish pus and traversed by hard coral-like bands, which proved to be branches of the pulmonary artery plugged with firm white substance intermingled with softer cancerous matter resembling the great mass of disease in the pelvis." [71] Weber [72] in the metastatic tumors of the lungs, made up of cartilage chiefly, from a similar pelvic growth mentions the "*kalkconcremente in der Grundsubstanz.*" The external iliac, the ileolumbalis, hypogastric and ischiatic veins were filled with tumor which extended to the common iliac; cartilaginous masses were found in the clots in the chambers of the right heart and in the tertiary branches of the pulmonary artery. The conditions described by Ernst [73] are still more remarkable. The renal, suprarenal, left spermatic and phrenic veins were all greatly distended with growths from an enchondroma arising in the twelfth thoracic vertebra; the vena cava to the heart was full of similar tumor tissue and although there were no tumor masses in the heart, just above the pulmonary valves masses occurred the size of a finger which were continued into all the branches of the pulmonary artery. No secondary tumors other than these intravascular growths were found in the lungs. There was, therefore, from the primary tumor to the peripheries of the pulmonary circulation a continuous growth of tumor with the exception of its interruption in the right auricle and ventricle. Birch-Hirschfeld [74] also has reported similar masses filling the branches of the pulmonary artery from an enchondroma of the shoulder.

Although it is true that most of these extensive intravascular growths have been cartilaginous metastases, there are numerous reports dealing with the formation of bone-containing metastatic tumors at some points along the route the tumor cells usually follow; the process is identical no matter what the activity of the cells results in, whether it is cartilage or bone. Hektoen [75] found "hard bony masses" in the metastasis from a tibial sarcoma which nearly filled the right ventricle and produced secondary growths in the lungs.[76]

The cylindrical bony masses, 6 by 1.5 cm. occurring in one lung with nodules of cancellous bone in the opposite lung cherry to hazel-nut in size, both from a femur sarcoma reported by Feistmantel [77] may very well represent growth within the branches of the pulmonary artery.

The possibility of the quite rare so-called "stalactite-osteomas" of the lung having an origin in the metastases of bone-producing cells which locate and grow in the blood vessels is quite natural.[78] As yet, however, there have been no reports in which such osteomas of the lung have been observed with a tumor of some bone. Another, and fully as interesting relationship, is suggested by the excellent description by S. Werdt,[79] of stalactite formations of bone in connection with the wide spread occurrence of multiple amyloid nodules in

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[67] Glasgow M. J., 1879, (11), 31.

[68] Phil. Tr. Royal Soc., 1780, (70), 323 and 578.

[69] Cheston states (p. 330): "Upon ſhewing it to ſeveral anatomical gentlemen, they were in doubt whether there might not be yet remaining ſome ſmall cavity in the duct, and were therefore deſirouſ I ſhould take the preparation out of the ſpiritſ to be examined more accurately. Thiſ I readily complied with and it waſ accordingly examined very circumſtantially by Dr. Hunter, Mr. Watſon, Mr. J. Hunter and Mr. Cruikſhankſ who honored me with a viſit for that purpoſe."

[70] Lectures on Surgical Pathology, 1865, Phil., 3d American Edition, p. 653.

[71] A number of writers have confused this with another observation by Paget of metastasis from a primary tumor of the testicle. The citation refers to conditions observed in a young girl 15 years of age.

[72] Virchow's Archiv, 1866, (35), 501. This report is frequently cited since it concerns the transformation to sarcoma of one of the numerous tumors of hereditary familial multiple enchondroma.

[73] Verhandl. d. Deutsch. path. Gesellsch., 1898, (2), 158.

[74] L. c., Case 1.

[75] Med. News, 1893, (63), 571.

[76] Rennenschein, according to Whittaker—20th Century Practice of Medicine, 1895, IV, 379—has reported a secondary chondrosarcoma of the tricuspid valve from a femur tumor; the growth in the heart was the size of a walnut.

[77] Wien. med. Wchnschr., 1904, (54), 2014.

[78] See Klebs, Handbuch der path. Anatomie, Berlin, 1868, II, 691; also Jernsalem, Allg. Wien. med. Ztg., 1901, (46), 246 and 256.

[79] Ziegler's Beiträge, 1908, (43), 239.

the trachea and bronchi. The suggestion of Jerusalem [80] followed the belief so strongly upheld at one time that bone was always of skeletal origin; its more recently experimental production and spontaneous occurrence by processes of metaplasia strongly support the prevalent opinion among pathologists that these stalactite osteomas originate in a chronic inflammation. On the other hand a considerable unanimity exists among the different observers of these rare lesions in the regularity with which they report an intimate relationship between the branching bone and the blood vessels of the lung.[81] Borst even suggesting that the process is one of ossifying arteritis.

The histological examination of various portions of the intrathoracic bony secondary growths from the body of C. P. proved fully as interesting as the foregoing considerations relating to the gross anatomy. Sections were studied after decalcification from lymph glands, both those about the trachea and above the bifurcation, from glands at the bifurcation, from the large spherical gland located opposite the mouth of the innominate, from the diaphragm and the costal pleura, and from numerous places in both lungs. From blocks infiltrated with celloidin coarse series were made by staining every fifth or every tenth section; and portions of the same blocks were sectioned in paraffine after removal of the celloidin. Perhaps the most interesting result of the histological examination is the demonstration that cartilage or any structure resembling cartilage is absent.

The bone in whatever locations examined is consistently like that found in all other locations, the difference being due to the greater or lesser development or growth and consequent variations with which cancellous bone is simulated. In only a few sections (from the apex of the left upper lobe) do the appearances suggest a rapidly growing tumor and even here the process of multiplication of cells has not prevented entirely that other manifestation of their activity, the formation of an intercellular framework which is the first evidence of substratum of bone. In these sections, however, the meshwork of bone is scanty, the compartments large, the cells are numerous and the nuclei in various stages of indirect division readily found. The cells fill up the compartments and in some rather large stretches (occasionally fields, Obj. 16 mm., Ocular, 4 Zeiss) practically none of the bony framework occurs. In these regions whatever there was of grouping or arrangement has been altered by hemorrhage, the cells appear quite loosely clustered in a capillary network which does not differ greatly in size from that surrounding pulmonary alveoli.

In all other locations, as previously stated, the differences are chiefly due to the amount of intercellular substance formed. In sections through very minute nodules the very first evidence of bone is obtainable on the margins where the process is extending (Fig. 5). Some of these nodules are so minute that not only they, but the surrounding alveoli for a slight distance as well, are contained in the field of a low power lens (Obj. 16 mm., Comp. Ocular, 8 Zeiss). In the center the mesh of bone is so close that in places only one or two cells are contained in a single compartment and the framework so wide that several cells side by side would be required to cover the distance across from one space to another. Large vessels occur in the more central parts and the bony framework about them is in some ways quite similar to an Haversian system (Fig. 5). On the edge of such small nodules as this the very first steps in the formation of bone are discernable for here the bone-forming cells have filled up the alveoli and in the centers of such intra-alveolar aggregations a very delicate network of bone occurs, in some respects like a fibrinous exudate, especially in the tenuity of the strands (Fig. 6). The delicate and intricate nature of these earliest meshes of bone is difficult to either adequately describe or illustrate (Figs. 7 and 9). The spaces in many instances are so small as to contain but a single cell, many are too small for that. Where these minute strands have been sectioned at right angles to their long axis their cut ends appear between the cells as rounded objects which are in many instances smaller than the nuclei of the cells. When the elastic tissue about the alveoli is stained by Weigert's method the fibers in many places are wider and heavier than these earliest bands of intercellular substance (Fig. 6). In some of the alveoli the intercellular substance is absent or almost so, and in such situations as well as in the sarcoma-like region mentioned in sections from near the apex of the left lung, opportunity is afforded to examine the cells concerned in its formation.

The cells (Fig. 7) are of various shapes, rarely spherical, more often oblong or eliptical and occasionally much longer than wide and with drawn out pointed ends. In the sarcoma-like region where the formation of bone is less marked, the cells are larger, measuring from 10 μ to 16 μ or even 20 μ in exceptional cells in their longest diameters.[82] In places where the intercellular substance is abundant their long axes average 9 μ to 11 μ. The nuclei are large and possess considerable chromatin. Occasional cells possess more than one nucleus and with a little search cells may be found possessing several nuclei arranged around the peripheral part of the cytoplasm and thus duplicating in some degree the megacaryocytes of bone marrow. In regions where cell multiplication is active and bone formation slight, karyokinetic nuclei occur from which six new nuclei would have formed; also other examples of multipolar nuclear division.

In sections from the diaphragm, the costal pleura, from the one large bony node in the auricular prolongation in the upper left lobe, and from the other places where the development of bone is more marked, the structure is greatly different from the delicate lace-like intra-alveolar network found about the minute nodes. Here wide bands of the bony framework are so abundant that they occupy most of the fields and the spaces between them are rich in blood vessels and in other respects resemble marrow. The bands vary in width (40 μ to 60 μ) although they are fairly uniform. They are the sections at all conceivable angles of a system of connected and anastomosing cylinders of bone containing the blood vessels and perivascular bone-forming and other marrow cells. The absence of any arrangement consistent with a supporting or other mechanical function of this cancellous bone is very conspicuous. For short distances the different parts of the scaffolding may be somewhat parallel, but on the periphery of the lung and in other locations there are reasons to attribute this arrangement to growth along lymph channels.

The absence in these heavy bands of any evidence of lamellar construction approaching closely that in normal compact bone remained unexplained until the intermediate stages of development between the fine lace-like intra-alveolar meshwork already described (Figs. 6 and 8) and these heavy scaffoldings of cancellous bone were studied. In such sections showing lesser amounts of bone production there are great differences in the size of the meshwork, the spaces between the bony trabeculæ. In some, the partitions do not anastomose extensively, but there are pointed irregular projections of bone into innumerable widely communicating

[80] L. c.

[81] See Arnsperger, l. c., 141 and Borst, Verhandl, d. physik. med. Gesellsch. zu Würzburg, 1898, Vol. 32.

[82] From measurements of the red blood cells the shrinkage has been 20 to 25 per cent.

and but partially enclosed regions (Fig. 8). In other sections the mesh is close and quite uniformly of a size to contain one or two cells (Fig. 9). In these and all other modifications there is one common feature the width of these bony partitions (seldom more than twice as wide as the bone-forming cells); in other words the bone-forming cells in this process have been able to form layers of a certain thickness, thicker or heavier layers they presumably were unable to form. These partitions, so uniform in their thickness, no matter what the size of the cavities they surround, have the property of staining more intensely on the margins with basic dyes (Fig. 10). Their paler central portions often possess very minute cavities possibly caused by decalcification. These characteristics of staining make it possible to trace these thin partitions through the complicated and tangled aggregations they form in the heaviest bands where the similarity to compact bone is greatest. In other words, the bony nodules and the sheets of compact bone on the diaphragm and on the right lung and extending into it along the obliterated interlobar fissures are made up of a heavy fromework in which there are primitive lamellæ simulating the lamellæ of normal bone to some degree, lamellæ fairly equal in thickness and staining more intensely at the margins. In the massing together of these thin layers there is, however, very little to remind one of the beautiful order of the lamellar construction of normal bone. The chief similarity perhaps is the very evident tendency to develop parallel or superimposed layers. The one fact which assumes greatest importance and really constitutes the link between the methods of bone formation under normal conditions and in these pleural growths is that already mentioned, *the regularity of the thickness of strata the bone-secreting or bone-forming cells produced as an intercellular framework.*

The conditions in the lymph glands do not differ so far as the structure of the bone and the proportion between bone and tumor cells is concerned, from those described for the pulmonary subpleural nodes and sheets. In the glands least involved the minute tumors occur in the peripheries of the gland (Fig. 11); in the large spherical and very bony lymph gland over the root of the innominate artery the structure is highly compact, heavy, bony framework and small marrow cavities.

Efforts to demonstrate canaliculi in the intercellular substance by various methods were failures. It is nevertheless likely that they too are present in some greatly altered form. Nor were there found in the marrow cavities any very definite evidences of the production of either red blood cells or leucocytes. In regions where the bone has a large and heavy framework and marrow cavieies correspondingly large there are small cells with intensely staining nuclei. They are about the size of the small lymphocytes and are located about the blood vessels both scattered and in clumps. These cells possess very narrow rims of cytoplasm and the quite general absence of any reticular arrangement of the chromatin in the nuclei such as is generally demonstrable in the lymphocytes, strongly suggest that they may be nucleated red cells. Post-mortem changes in the primary tumor made its histologic examination valueless.

As for the primary growth in the head of the tibia responsible for these secondary tumors, the unbroken regularity and normal contour of the cortex of the tibia as disclosed in the single section made (Fig. 4) is decidedly opposed to its myelogenous origin. Other arguments for its periosteal origin are the large amount of bony tumor tissue without and around the shaft, and the fact that ossification as well as generalization occurs with periosteal tumors much more frequently than with those of central origin;[83] in fact myelogenous ossifying tumors are quite rare. Bennecke, in 1904 was able to find in literature but one example of "enostosis," that recorded by Virchow,[84] to add to his own.[85] Buerger[86] repeatedly mentions perforation of the cortex and apparently as though it had occurred from within, in describing two highly ossified tibial tumors. From the description, however, the tumors are quite like that shown in Figs. 3 and 4 and correspond best with ossifying periosteal growths; there were evidently no metastases in connection with them for Buerger relates but few clinical details. The tumor described by Muir,[87] beginning in the upper end of the humerus, "as hard as ivory all through except at the extreme margins where it could be cut without decalcifying," and filling up the medullary cavity completely as well as that reported by Landow,[88] are also to be considered as periosteal tumors.[89]

Conspicuous notice is given in the French literature[90] to the account by Bouveret[91] of a primary growth of the bony thorax which caused rather wide-spread secondary growths containing bone. The primary tumor was larger (26 by 18 cm.) than an adult head and grew deeply into the right lung. The metastatic tumors developed in the vertebral muscles, the mesentery, subperitoneal tissues, in both kidneys, in the pericranial tissues and subdurally, in the radius, one cubital and the left iliac bones, the subcutaneous tissues and in the heart where there were two; there were none in the lungs. In many respects the conditions described by Bouveret are exceptional. All the secondary growths contained bone; some were quite bony and the bone was centrally located; the secondary tumors possessed no cartilage and Bouveret compared the ossification to the normal intramembranous development of bone. In the larger secondary growths the ossification resulted in the formation of cancellous bone and Bouveret described and illustrated homogeneous intercellular trabecula and osteoblasts quite similar to the structures I examined in the metastatic growths in the lungs and pleuræ of C. P. Janeway[92] also describes ossification and fails to mention any cartilage in the secondary growths in the lungs from a sarcoma of the femur.

In view of the indefinite descriptions of ossification, calcification and even petrification[93] in osteo-sarcomas, which have prevailed in the text-books for so many years, the vigorous and lucid account by Billroth[94] half a century ago, is a striking indication of his clear vision; for he described the for-

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[83] Volkmann, Handbuch d. allg. u. spec. Chir. [Pitha-Billroth Chirurgie], Erlangen, 1865-1872, II, 469.

[84] Die krankhaften Geschwülste, II, 42.

[85] Deutsche med. Wchnschr., 1904, (30), 941.

[86] Proc. N. Y. Path. Soc., 1908, (n. s. 8), 111.

[87] Glasgow M. J., 1899, (52), 438.

[88] Centralbl. f. Chir., 1900, (27), 1061.

[89] Bennecke too (l. c.) considers the growth reported by Landow as of periosteal origin.

[90] Dictionnaire enclycopédique des sciences médicales, 1882, (18), 269; Traité de Chirurgie, Duplay and Reclus, article on tumors by Quénu, Paris, 1890, I, 445, and other similar works.

[91] Sur une tumeur osseuse généralisée à laquelle conviendrait le nom de tumeur à ostéoblasts, Leon Bouveret, Thèse de Paris, 1878.

[92] Med. Rec., 1877, (12), 524.

[93] Ziegler, General Pathology, English Translation of the 10th German Edition, N. Y., 1903, p. 430.

[94] Beiträge z. path. Histologie, Berlin, 1858, 100.

mation of an intercellular substance by the cells of sarcomas, a substance which he referred to as bone-cartilage in which the lime salts were later deposited, in a manner which would have proven quite helpful to students of the histogenesis of bone,[95] had they but applied it to normal conditions of development. Indeed there is but little in the most recent accounts dealing with the morphology of normal osteogenesis which Billroth failed to recognize in the production of bone in tumors save changes in designations and some of the results of elaborations of technical methods. His bone-cartilage corresponds to the "*substance fondamentale*" of other writers, and to the delicate intercellular network I have described in the alveoli resembling fibrin so remarkably. As has already been remarked, this intercellular substance attains a certain maximum width and the heavier frameworks are formed by their closer approximation. In spite of repeated assertions[96] that lamellated bone is not formed in osteo-sarcomas, the distinction, it must be admitted, is largely one of degree and of a difference in arrangement. This disposition of the secondary growths of bone sarcomas to reproduce in such marvellous detail at times cartilage, at other times cancellous bone with marrow which it is claimed may possess depots of erythrocyte formation,[97] is highly important since one of the chief objections to a parasitic origin for tumors has always existed in this tendency of malignant tumors to form tissue at a distant point with some semblance to that from which the primary tumor grew.

The symptoms caused by the growth in the lungs and pleuræ of these metastatic tumors have frequently, as in the case of C. P., been ascribed to tuberculosis,[98] indeed this mode of death has been so commonly reported, and even after the removal of an osteo-sarcoma, that it has interfered greatly in the accumulation of statistics of the results of operation. Reinhardt[99] refers to the difficulties of distinguishing the two affections, and Kramer[100] to the likelihood of the "*Brustwassersucht*," reported as the cause of death in one instance 4¼ years after operation being in reality due to secondary growths. Many reports concern death from pleurisy, some from pneumonia. In the chapter devoted to aneurysms of bone Bell[101] mentions a museum specimen in St. Bartholomews Hospital, from a patient in whom during life pulsation in the aneurysm was very evident, but who "died from pleurisy before any operation could be performed for her relief": also of a specimen in his possession of an aneurysm of the humerus removed by his father from a woman 60 years of age who "suffered no return of the complaint, but died two years afterwards from a sudden attack of pleuritis." There is little doubt that the pleuritis referred to in these patients was in reality a bloody effusion due to pleural growths, the secondary tumors of the central myeloid sarcomas formerly considered as bone aneurysms being prone, as already has been pointed out, to produce similar bloody and even cyst-like growths within the lungs. The dyspnœa suffered by the patients with secondary intrathoracic growths has been emphasized by many observers; death from orthopnœa has been reported in some instances. The hæmoptysis frequently leads to a persistent search for tubercle bacilli.[102] On the other hand in comparison with the space in the thorax which the tumors may occupy, the symptoms, as already has been stated, are relatively few. The considerable periods between the removal of the primary growths and the development of symptoms due to the intrathoracic tumors make the simulation of tuberculosis a very important matter. A period of four years is regarded by many surgeons as the minimum *post operationem* interval which must elapse before cure may be regarded as likely and this estimate has reference to distant metastases as well as local recurrences. That still longer periods represent a still larger margin of safety is illustrated by the death reported by Waterhouse[103] from the tumors in the lungs secondary to an osteo-sarcoma of the humerus removed eight years before.

[95] For an account of the controversies concerning the development of bone, see Retterer, J. de l'Anat., 1905, (41), 561.

[96] Ribbert, Geschwülstlehre, Bonn, 1904, 207 and Menetrier, Le Cancer, in the Traité de Médecine et de Thérapeutique by Brouardel, Gilbert and Thoinet, 1908, XIII, 399.

[97] Müller, l. c., p. 413, referred to the firm diploë in secondary bony tumors of the lung; see also Borst, Die Lehre von den Geschwülsten, Wiesbaden, 1902, I, 440.

[98] Boyer states that that a patient from whom Morigi removed an osteo-sarcoma of the knee (which together with the recurrent growth were studied by Scarpa) subsequently died of tuberculosis, Traité des Maladies Chirurgicales, Paris, 1822, II, 521.

[99] L. c.

[100] L. c.

[101] A Treatise on Diseases of Bones, London, 1828, 156.

[102] See the report by Dowling, l. c.

[103] Lancet, 1900, (2), 1203.

ARMY MEDICAL CORPS EXAMINATIONS

AT WASHINGTON, CHICAGO AND SAN FRANCISCO.

The Surgeon-General of the Army announces that the War Department has appointed permanent boards for the preliminary examination of applicants for appointment in the Medical Corps of the Army to meet at Washington, D. C., Fort Sheridan (near Chicago), Illinois, and San Francisco, California, in addition to the usual preliminary examination boards that are assembled at various Army posts throughout the United States from time to time. The permanent boards will hold sessions on the second Monday of each month.

A limited number of successful candidates will be appointed first lieutenants in the Medical Reserve Corps (salary $2000 per annum), and assigned to Army posts until the next session of the Army Medical School, when they will be ordered to attend the school as "student candidates."

Applicants must be citizens of the United States, between 22 and 30 years of age, graduates of reputable medical schools, of good moral character and habits, and shall have had a year's hospital training after graduation, or its equivalent.

Full information concerning the examination can be procured upon application to the Surgeon-General, U. S. Army, Washington, D. C.



FIG. 1.—The external appearance of the right lung. (*a*) The right lung. (*b*) The diaphragm. (*c*) The space between the two into which the hand can be inserted edgewise. (*d*) Bosses on the lower margin of the right lower lobe.



FIG. 2.—The right lung sectioned sagittally. (*a*) The diaphragm. (*b*) The inner table. (*c*) The outer table of the calvarium-like sheet of bone on the posterior border of the lung.



FIG. 3.—Primary tumor in the tibia, front view.



FIG. 4.—Surfaces exposed by sectioning the primary tumor sagittally.

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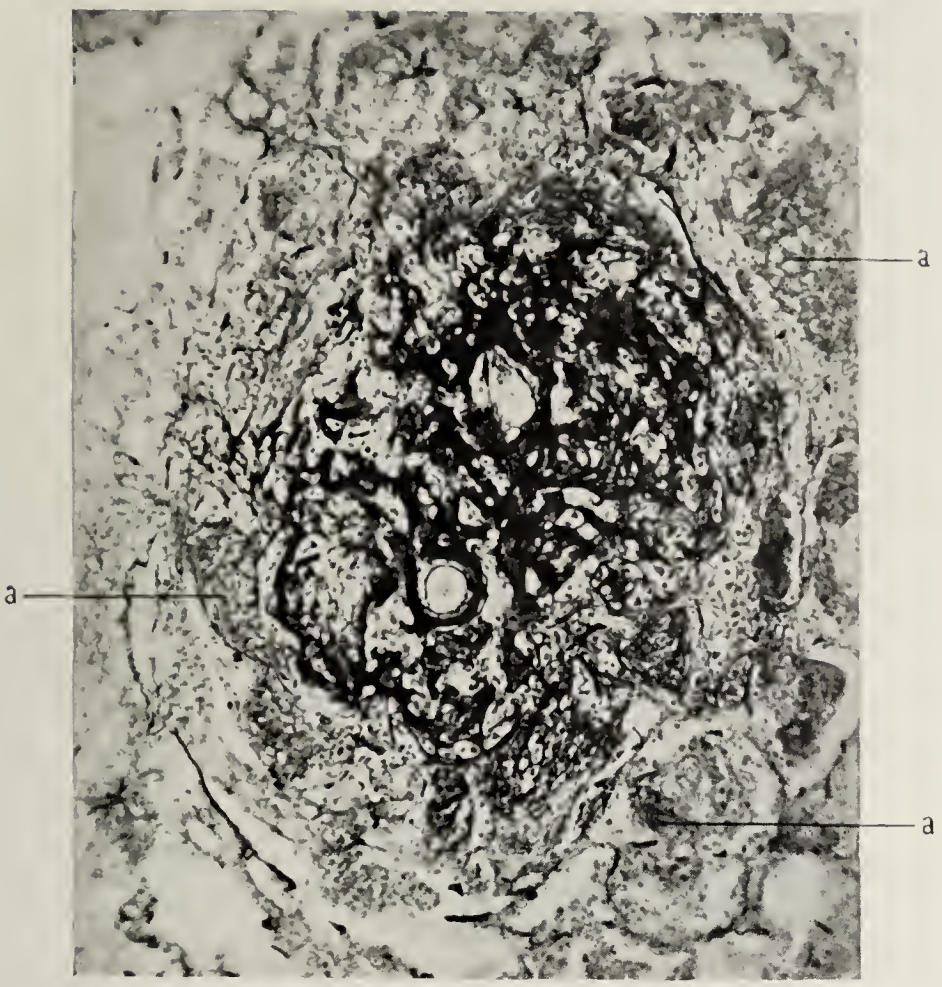


FIG. 5.—Section through a minute metastatic growth almost 1 mm. in diameter; the heavy meshwork with Haversian-like canals containing blood vessels in the center. (*a*) Early intra-alveolar formation of delicate network of bone.

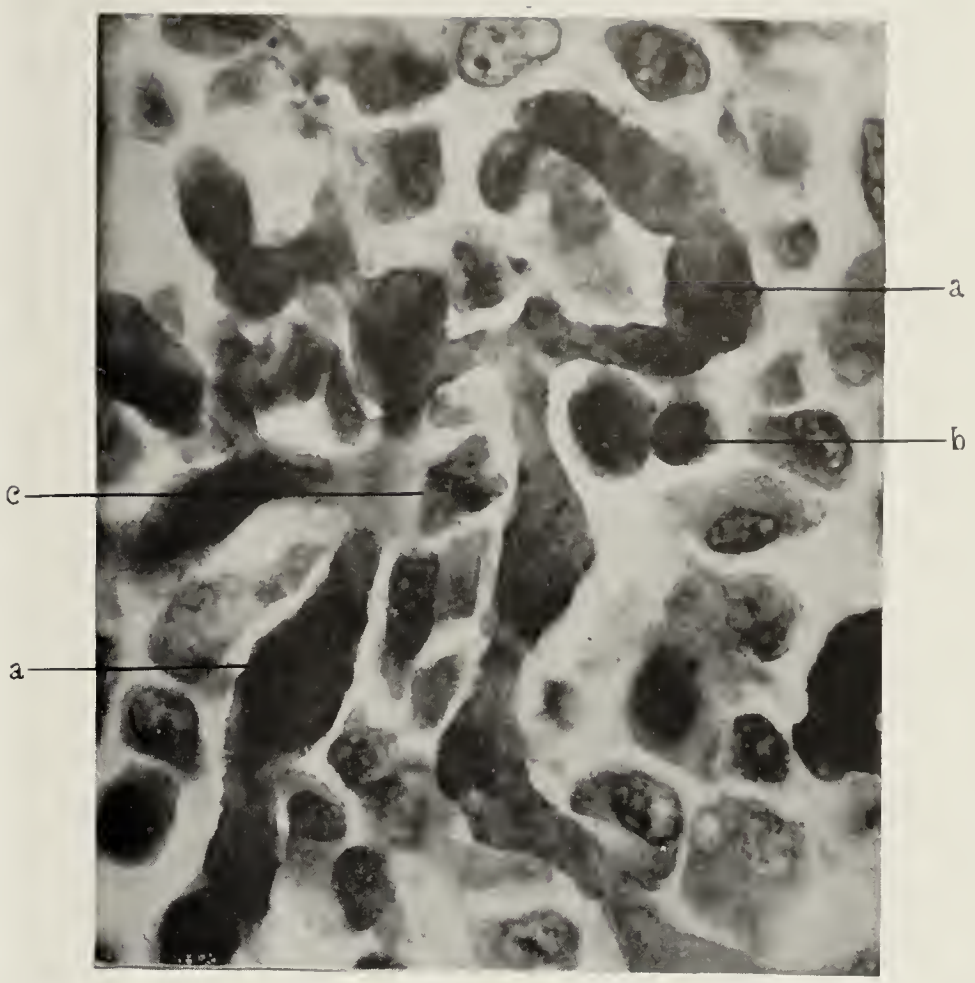


FIG. 7.—The bone-forming cells and the intercellular framework. (*a*) Framework sectioned lengthwise. (*b*) Framework sectioned across showing that a pillar or column formation occurs. (*c*) Mitotic nucleus.

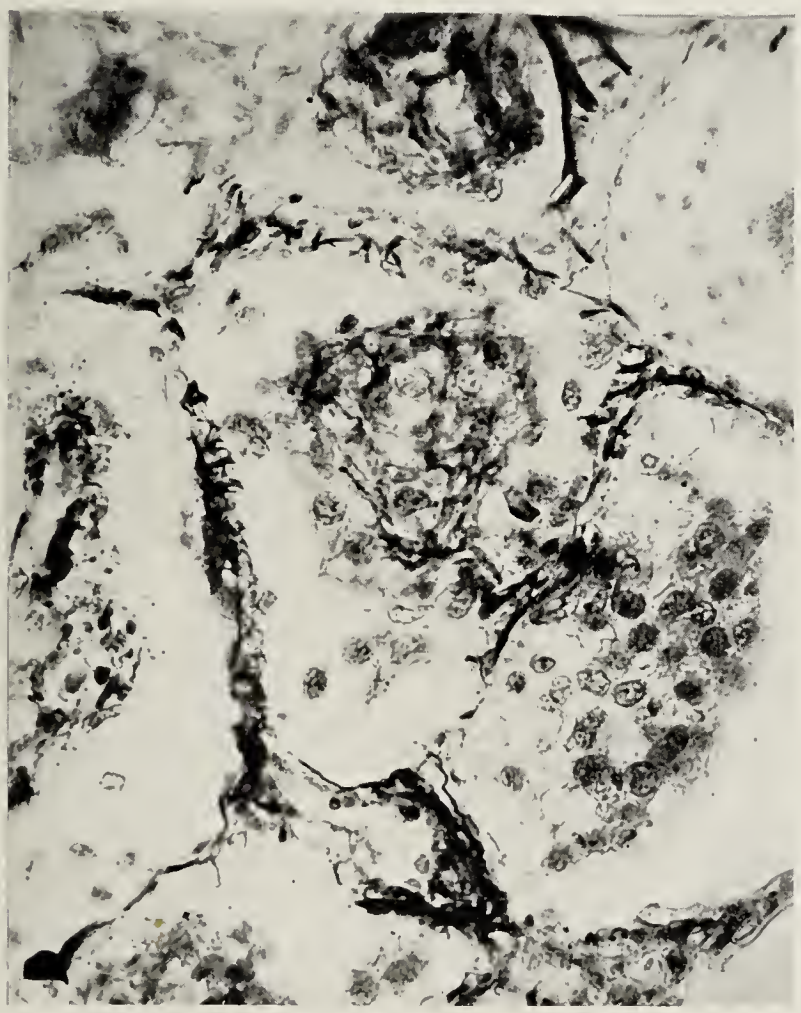


FIG. 6.—Fibrin-like minute mesh of bone centrally located among bone-making cells in an alveolus on the periphery of such a nodule as shown in Fig. 5.

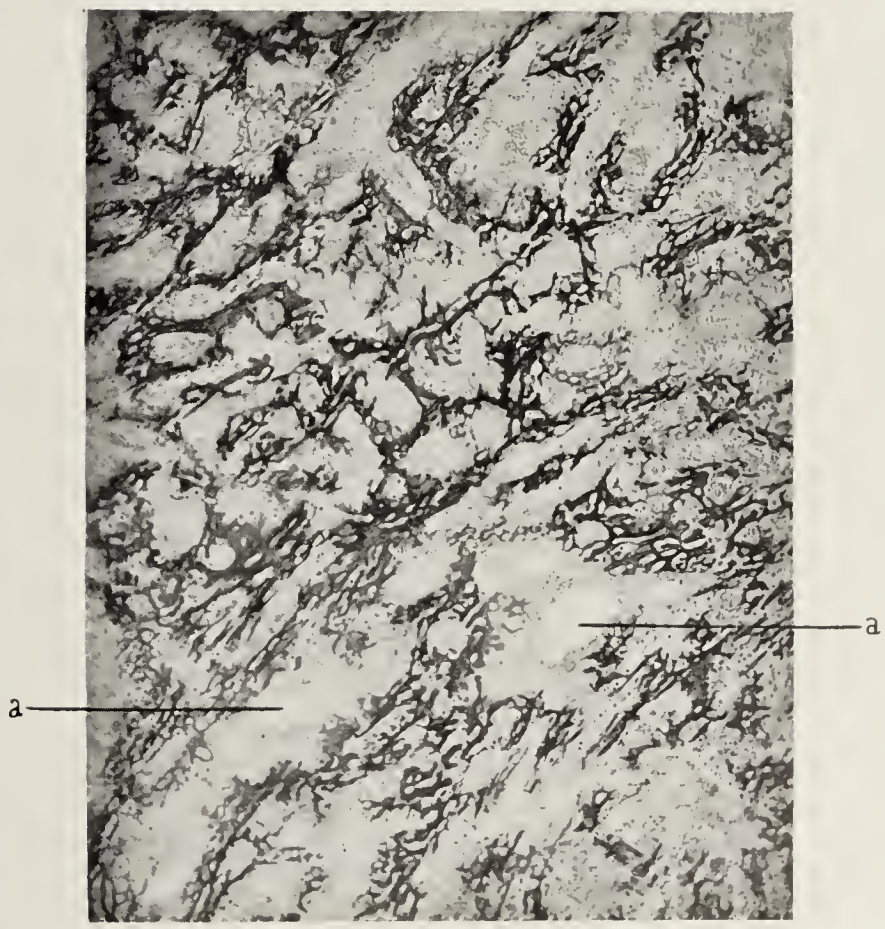


FIG. 8.—A network of bone in which the thin partitions are in a measure massed together to form heavier strands which enclose large blood vessels and marrow cavities. (*a*) Large veins in marrow cavities.

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FIG. 9.—Delicate meshwork of bone, the spaces containing one, two or only a few bone-making cells.

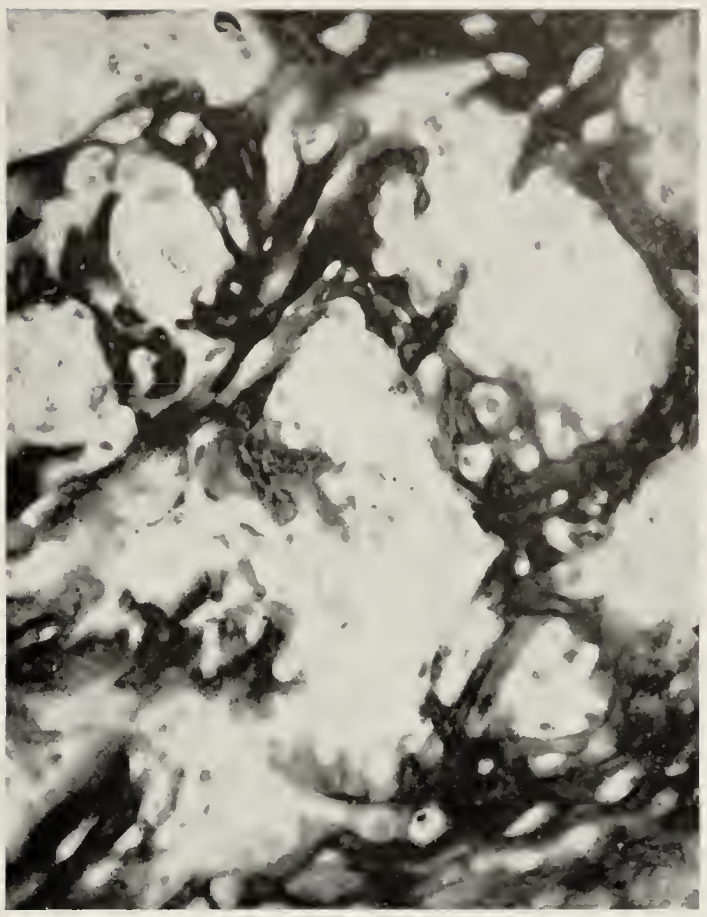


FIG. 10.—A portion of the structure shown in Fig. 7 which illustrates the affinity of the edges of the first (primary) layers of bone formed, the layers which are analogous to the lamellæ of normal bone, for basic dyes.

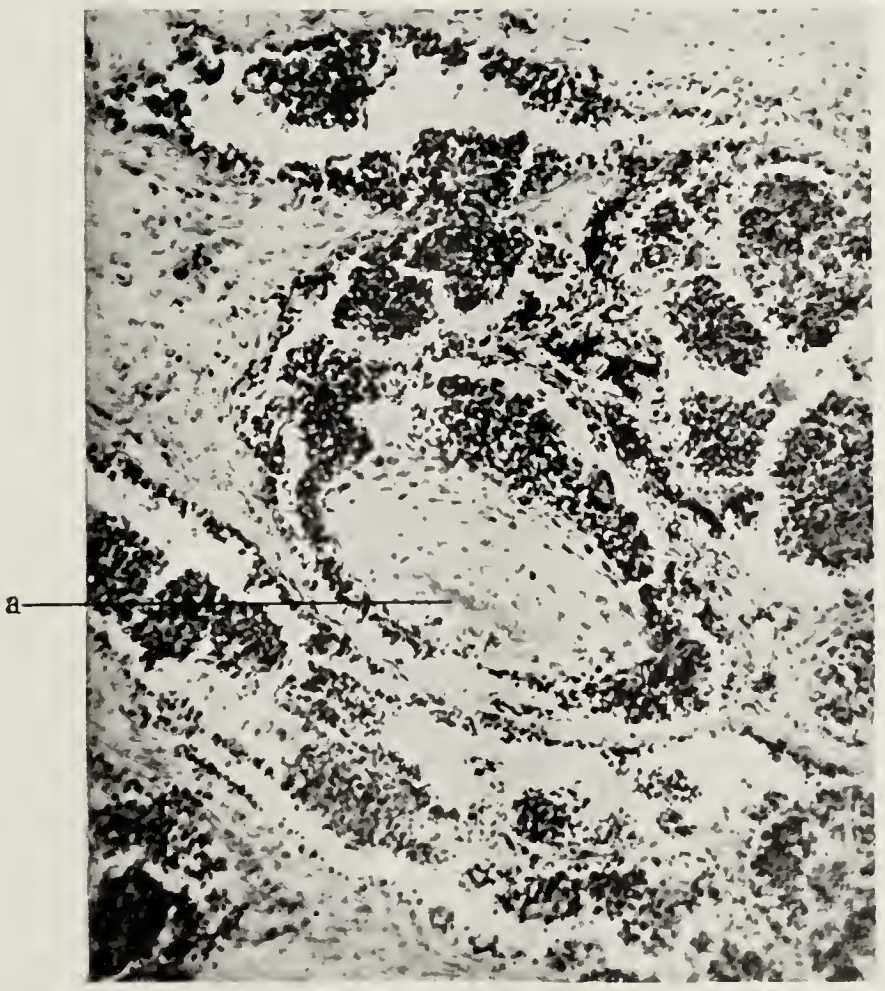


FIG. 11.—Minute nodule of bone in a lymph gland. (*a*) Early bony meshwork surrounded by bone-making tumor cells.

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ARETAEUS THE CAPPADOCIAN.[1]

By Eugene Fauntleroy Cordell, M. D.,
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Of Aretaeus, personally, we have no direct knowledge, further than that conveyed by the title. This indicates that he was a native, or at least a citizen, of Cappadocia, a mountainous country in the eastern part of Asia Minor bordering on the Euphrates. It is considered probable that he lived in the second century of the Christian era, about the time of Galen, and it has been conjectured that he studied at the great seat of learning in Alexandria. Johannes Wigan[2] thinks he must have resided in Italy because he recommends the Italian wines, the Falernian, Fundan, Signine and Surrentine, all of which are mentioned in the works of Horace, Pliny, Martial and other Roman writers.

But little light is thrown upon the subject by his writings. He does not mention any of his supposed contemporaries, as Galen, for instance; indeed he seldom refers to individuals. The Iliad is quoted some twelve times and there are some eighteen allusions to the works of Hippocrates, chiefly the Aphorisms. We read also of the antidotes of Philo, Symphon, Vestinus and Mithridates, and these names give us some hints as to the age of our author. Philo lived at Tarsus. He is referred to by Celsus and Galen, by the former as the inventor of an eye-salve. The Philonium, or Antidotum Philonianum, is mentioned by Quintus Serenus Sammonicus, a physician, about A. D. 216, and by Marcellus Empiricus, also a physician, about A. D. 400. The Mithridatium took its name from Mithridates, King of Pontus—century before Christ; it consisted of 54 ingredients. According to Wigan,[3] in the "Compound Medicine of Vipers," reference is made to a preparation of a certain Andromachus, of Crete, the physician of Nero. This, theriaca, as it was called, because first intended for the bite of serpents, although later employed against all kinds of diseases, indiscriminately, consisted of 61 ingredients. I can find no references to Symphon or Vestinus.

Aretaeus cites the plague of Athens in relation to the supposed poisoning of the wells in the Piraeus by the Peloponnesians, remarking that this erroneous idea was natural in view of the resemblance between the effects of such substances and those of pestilential diseases.

In correspondence with his reverence for the ancient writers, it is to be noted that Aretaeus used the Ionic dialect—that of Homer, Herodotus and Hippocrates. This fact, however, is no argument against the date assigned to him, as Lucian, Arrian and others of the second and third centuries, sometimes do the same.[4] That he was a surgeon of skill and experience, we may infer from his work on that subject—unfortunately lost—and his references to operations, as this: "I once made an opening into an abscess in the colon on the right side near the liver and much pus poured out, and much also passed for several days by the kidneys and bladder, and the man recovered."[5]

The titles of the works of Aretaeus were: I, On the Causes and Symptoms of Acute and Chronic Diseases; II, On the Therapeutics of the Same; III, Fevers; IV, Surgery; V, Prophylaxis; VI, Diseases of Women; VII, Pharmacy. Only the first and second of these are now extant, in eight books and in a very mutilated condition, whole chapters being lost; thus we find 22 entire chapters missing, besides many parts of others.

It is a singular fact that a writer of such unquestionable merit as Aretaeus should have been almost entirely ignored by ancient writers. As he does not refer to Galen, so Galen does not refer to him; and this circumstance, together with a decided correspondence between their literary and professional views, Adams considers to be a proof that they were contemporaries. Alexander of Aphrodisias, third century A. D., Aetius, about A. D. 550, Paul of Aegina, about 100 years later, and the author of the Euporista, a work of unknown origin, are the only ancient authorities that quote him by name. He is wholly ignored by the Latin and Arabian writers. A possible explanation of this, as suggested by Adams, may be found in the numerous compilations which were made at an early period, in which his writings and views may have been merged. The first modern edition of Aretaeus was the Latin translation of Junius Paulus Crassus, a professor at Pavia, and was printed at Venice in quarto, in the year 1552. Two years later this was followed with a first Greek edition at Paris by Jacobus Goupylus. Numerous editions have since appeared, among the more recent being one in Greek and English by Francis Adams, published by the Sydenham Society in 1856, a work like everything from Adams' pen, of great erudition and merit, and which the modern reader will find it most convenient to consult.

Let us now examine the views of our author, and first those upon anatomy and physiology.

The constituents of the body are found in the condition of humor, spirit (pneuma) and solid, and upon the proper composition and relations of these life and health depend. As in Hippocrates, there are four humors—blood, phlegm, white bile and black bile. The blood is formed from the food in the liver. The phlegm is secreted by the brain and descends upon the different organs through the cribriform plate of the ethmoid. White bile is manufactured in the liver, black bile in the spleen. The vapors, a variety of humor, also proceed from the spleen.

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[1] Read before the Johns Hopkins Hospital Historical Club, March 8, 1909.

[2] Aretaeus Cappadox, Oxoniæ, 1723, fol.

[3] *Op. cit.* Also Galen, De Theriac ad Pison., et de Antidot.

[4] Wigan, *op. cit.;* Sprengel, Gesch. der Arzneyk., Halle, 1823, II, 60; Robert Fuchs, Handb. der Gesch. der Med., Neuburger u. Pagel, Jena, 1902, I, 366; Francis Adams, Extant Works of Aretaeus, Lond., 1856 (Syd. Soc. Ed.).

[5] Adams, *op. cit.*, I, 9.

The heart is the seat of the soul and of animal heat; the source of respiration and of life. "What other organ is more important," he asks, "for life and for death?" It draws in spirit (pneuma) by the lungs, which are subordinate to it. The aorta arises from the heart, and in the chest lies on the left of the vena cava, with which it sympathizes. By it the spirit is carried outwardly while the veins convey the blood to all parts for their nutrition.[6]

The liver is the source of the veins; indeed it is for the most part a mere concretion of blood. Its function is to produce blood and bile. All the food is brought by the vena portæ from the stomach and intestine to the liver, whence it is carried by the vena cava as blood to the heart. According to certain of the philosophers, the soul has its seat in the portæ of the liver, but Aretaeus does not sanction this view. He, however, quotes Homer to the effect that bile and anger are synonymous terms, an idea very prevalent through all antiquity. Inflammation of the liver produces jaundice, white jaundice, due to the obstruction of the bile ducts and absorption. He knows of the portal circulation, the ramifications of the vena portæ in the liver and the rise of the hepatic veins carrying the new-formed blood to the vena cava, being clearly described.

The lungs are of loose texture resembling wool. They are by nature devoid of sensation and hence there is no pain in pneumonia unless the membrane covering them is involved in the inflammation. The kidneys are true glands, but are whiter than the ordinary glands—more like the liver. They resemble the testes, but are curved and broader. They contain small cavities like sieves for the percolation of the urine, which are connected with the bladder on either side by canals. There are short and broad veins leading from the liver to the kidneys, by which the matters passing out from the former are evacuated. These veins are straight and give to the kidneys the appearance of being suspended near the liver (he refers evidently to the renal veins which empty into the vena cava opposite the liver). Jaundice may arise from affections of the kidneys as also of the stomach, spleen and colon.

The stomach presides over pleasure and disgust, by promoting good digestion and good spirits in health and their opposites in disease. A part of the digestion goes on in the colon, which is a thick and fleshy part of the intestine.

The spleen is the strainer of the black blood and the jaundice from it is dark green. It is porous and insensible; often becomes greatly enlarged (scirrhus), though seldom suppurating, and is especially subject to disease in marshy localities.

The womb is described thus: "In the middle of the flanks of women lies the womb, a female viscus, closely resembling an animal, for it is moved of itself hither and thither in the flanks, also upwards in a direct line to below the cartilage of the thorax; and also obliquely to the right or the left either to the liver or spleen; and it likewise is subject to prolapses downwards, and in a word, is altogether erratic. It delights also in fragrant smells, and advances towards them; and it has an aversion to fetid smells, and flees from them; and, on the whole, the womb is like an animal within an animal."[7] Hence, it may be suddenly carried upwards, compressing the lungs, heart, diaphragm, liver, intestines, obstructing the breathing and speech, and compressing the carotids and causing stupor.[8]

The brain is the seat of sensation and the source of origin of the nerves. It also secretes phlegm.

The blood he calls the nutriment of the body—"the food of all parts, the heat of all parts and the color of all parts." And hence, although it is also "the food of inflammation," and we must remove it in that condition, he inculcates the importance of husbanding it as much as possible.

In the enumeration of diseases, we meet with names familiar, as apoplexy, epilepsy, tetanus, pleurisy, pneumonia, hysteria, satyriasis, gonorrhœa, diabetes, icterus, asthma, cholera, phthisis, dropsy, arthritis, dysentery. There are also many unusual or mysterious terms, as phrenitis, lethargy, marasmus, cynanche, causus, ileus, kephalæa, skotoma, pneumodes.

It is important to remember that these names do not always mean what we understand them to mean; some indicate symptoms, some embrace several distinct diseases. The cause of phrenitis is seated in the head or senses. Heart disease is considered under the title, syncope or cardiacs. Affections of the viscera are placed in groups—those "about the liver," those "about the kidney," etc. A very curious term for a disease is elephas or elephantiasis, so named from a supposed resemblance to the animal. It is also called satyriasis, leo, morbus herculeus, terms indicative of its magnitude and severity. The account of it begins with a description of the animal. Adams believes it was syphilis, which (under the names lichen or mentagra) was prevalent at Rome in the first and second centuries A. D., and of which descriptions are given in Pliny, Martial and Marcellus Empiricus. It was attributed by these Roman writers to the fashionable practice of salutation by kissing. The whole description conveys the impress of exaggeration which is so foreign to Aretaeus, and Sprengel charges him with having yielded here to the temptation to indulge in style and fine writing.[9]

The causes of disease are various. Cold acts generally, especially in affections of the air-passages, and is assisted by moisture and draughts. It is one of the causes assigned for tetanus.

[6] The spirits are not elaborated in Aretaeus to the same extent as in the system of Galen, according to which the blood takes up the "natural" spirits in the liver, is laden with "vital" spirits when it reaches the left ventricle and on reaching the brain generates "animal" spirits, which circulate thence by the hollow nerves and subserve the higher functions of the body. (See Foster, Hist. of Physiol., 1901.) Aretaeus speaks only of the spirit (pneuma) which is taken in with the breath.

[7] Adams, *op. cit.*, p. 285.

[8] In passing, I feel compelled to remark that this description of the uterus by Aretaeus is incomprehensible, being at total variance with his general clearheadedness and common sense. I shall only remark that it was the prevalent opinion on the subject and that it continued such for many centuries.

[9] Adams, *op. cit.*, p. 370.

Climate is a factor—that of Egypt produces throat diseases. Season is concerned. Cachexia causes anasarca and phthisis. Food faulty in quality and quantity leads to angina, apoplexy, dropsy, dysentery, ileus, inflammation of the liver. Wine in excess causes angina, apoplexy, inflammation of the liver, paralysis, madness. Medicines may be concerned: cantharides may cause inflammation of the bladder; buprestis (melœ vesicatoria), dropsy; mandragora and hyoscyamus, furor, etc. Instruments may be to blame: the catheter may cause injury and even sphacelus of the bladder. Injuries are often operative: a wound may cause tetanus; blows, falls, etc., apoplexy, abscess of lungs; heat, fishbones, blows, angina or quinsy. Many diseases arise from others, as suppression of urine from a calculus; phthisis from cough, pneumonia, ulcer and hemorrhage of the lungs; dropsy from disease of the liver and spleen, asthma and gout; empyema from pleurisy and pneumonia; disease of the liver from dysentery; tetanus and prolapsus uteri from abortion; paralysis from gonorrhœa; asthma from gout, etc. Suppressed discharges and secretions are often productive of disease. A redundancy of vapors causes disinclination to exertion, weight in the head, noises, flashes of light, etc.

In connection with this mention of the "vapors" by Aretaeus, the following *morceau* may be of interest:

> The King is subject to vapors—vapors which proceed from the spleen and the melancholic humor whose livery they wear, in the chagrin they impart and the desire for solitude which they engender. They permeate by the arteries to the heart and to the lungs, where they excite palpitations, disquietudes, lassitudes and dyspnœa; from thence proceeding upwards they even reach the brain, and there by disturbing the spirits of the optic nerves, they set up vertigo and swimming of the head, and colliding elsewhere with the nervous principle, cause weakness of the limbs to such a degree that support is necessary in walking, a circumstance very troublesome to anyone, but more particularly the King, who has need of all the head he has in the discharge of the affairs of state. His temperament tending much to melancholy, his sedentary mode of life, his presiding much in councils, his natural voracity, which causes him to eat too much, greatly promote this malady, by reason of the excessive and inveterate obstructions the crudities excite in the veins, which, retaining the melancholic humor, prevent its escaping by the natural passages; and so by their retention give rise to heat, fermentation and tempestuousness; thus there is no reason for surprise that bloodletting so powerfully awakens the disorder, seeing that it is so certain that by the movement it excites in the entire volume of the blood and throughout the veins, it agitates the melancholic humor in its very sources, and without evacuating it aggravates its ebullition and evaporation.—*Journal de la Santé du Roi* (a daily record of the health of Louis XIV, kept by his physicians of the Paris faculty by his order for 64 years, 1647-1711). Molière and his Medical Associations, by A. M. Brown, M. D., London, 1897.

Aretaeus' fame rests largely upon his pictures of disease. None of the ancients can compare with him in his power to portray disease. We lose much of the effect, of course, in translation, especially in literal translation. His powers of description are best seen in such affections as tetanus, epilepsy, hysteria.

"Tetanus is an exceedingly painful spasmodic affection, following a wound, blow, abortion or exposure to cold, and proving quickly fatal. It begins in the muscles and tendons about the jaws, extending thence to the whole frame. The convulsions bend the body backwards so that the head is lodged between the shoulder-blades (opisthotonos), or forwards (emprosthotonos), or extend it out straight. In all cases the jaws are locked so firmly that they can only with difficulty be prized apart. If the teeth be forcibly separated and liquid be then poured into the mouth, it is not swallowed, owing to the contraction of the fauces, but is squirted out or held in the mouth, or regurgitates through the nostrils. The face is congested and variously distorted, the eyes are fixed or rolled about, the cheeks and lips are tremulous, there is grinding of the teeth, the jaw quivers, there is subsultus of muscles and there is a painful sensation of suffocation. The urine is retained or passed involuntarily."

"The paroxysm of epilepsy is preceded by circular flashes of purple or black, or it may be of all the colors of the rainbow, or by peculiar sounds, or by a bad smell, or by manifestations of irritability or anger, or by a feeling of dread, as of an attack by a wild beast. This is followed by contractions, first involving the thumbs and great toes, and rapidly extending to the head, when the patient falls suddenly as if struck with a piece of wood or with a stone, and indeed this impression of having been maliciously struck down may remain after recovery, especially in first attacks.

"When the affection has become habitual, patients realize from the seizure of a finger or other part that a convulsion is coming on and call upon those present to bind or stretch such part. By such means the attack may be postponed for a time. With the fall the patient becomes unconscious, the hands are clenched,[10] the limbs are stiff or are dashed hither and thither, the head is drawn forward so that the chin rests on the chest, or backward, or to one or other shoulder. The lips are compressed or drawn wide apart, or stretched sideways over the teeth as in smiling. The tongue protrudes from the mouth, incurring the risk of being badly bitten, the eyeballs are rolled inwards, the eyelids for the most part wide apart showing the white and quivering, the cheeks are congested, the eyebrows frowning. Soon the countenance becomes livid and swollen, the vessels of the neck are distended, the patient moans and makes guttural noises as if he were being throttled, foam issues from the mouth, and there is erection of the genitalia. As the attack draws to a close there are unconscious discharges of urine, semen and fæces, and the patient lies pale, torpid, heavy and exhausted. At length he rises up, the paroxysm being ended."

"In hysteria the woman experiences a choking with loss of breathing and speech like that which occurs in epilepsy. There is insensibility and deep stupor. The attack may come on suddenly with a fall. The limbs are seized with jerkings, both voluntarily and involuntarily. During the unconsciousness the patient lies as if dead, except that her eyes are bright and not entirely fixed and her color is more ruddy than usual."

[10] Not "clasped" as Adams has it.

He notes the rusty sputa and the crisis on the seventh day in pneumonia, the optimism of consumptives, the vicarious hemorrhage in menstruation. Pain in the shoulder in affections of the liver is noted and ascribed to dragging on the pleura.

The differences between arterial and venous hemorrhage are well described.

The symptoms of phthisis are enumerated as follows: chronic cough, spitting of blood and pus, hectic fever, colliquative sweats, loss of strength and flesh, pallor, loss of appetite, hoarseness, fingers bony, with thickened joints and curved nails, nose slender and sharp, cheeks red with cheek bones prominent, eyes brilliant and hollow, lips drawn over teeth as if smiling, muscles of arms imperceptible, not a vestige of the mammæ—the nipples only being visible, the ribs showing through the skin, the throat prominent and chest narrow, the joints and bones devoid of flesh, the shoulder blades projecting like the wings of birds, a tendency to looseness of bowels, the whole aspect cadaverous.

The divergence of the tongue in facial paralysis is noted, and caution is inculcated not to mistake the affected for the unaffected parts: "in laughter, speaking or winking, the true state of matters becomes manifest, for the parts affected are all drawn aside with a smack; the lip expresses no smile and is motionless in talking, the eyelid is immovable, the eye fixed, and the sense of touch is lost, while the sound parts speak, wink, feel, laugh."

One of the most interesting features is the evidence that he practiced physical diagnosis just as we do now, by inspection, palpation, percussion and auscultation.

We see inspection in his observation of the character of the respiration, of the posture, decubitus, etc., of the color, heat and swelling of the surface, the condition of the veins, the tongue, the pulse, the nails, the sputa, etc. We find this *passim* and it is only what we would expect from so careful and acute an observer.

He likewise resorts to palpation, as in enlargement of the liver, "the boundaries of which are distinctly circumscribed, for the hand applied in pressure, after passing beyond the circumference of the liver, sinks down into an empty space in the abdomen." He notes also "pain on pressure below the false ribs." He observes the tendency to painless swelling of the spleen, which sometimes extends clear over to the right side, and is as hard and unyielding as stone, causing many observers to be deceived into the belief that it is an affection of the peritoneum. Sometimes the organ floats in the abdomen and can be moved about from side to side. Rarely it suppurates, when it becomes soft and yielding to the touch. He notes a relationship of these cases of enlarged spleen to marshy localities, bad water and the autumnal season of the year. In ascites by strong compression over the lower belly, the fluid can be made to change its position. In the same condition pressure with the finger leaves an indentation which continues for a considerable time.

The following are examples of percussion: "In tympanites, the abdomen, when tapped, or percussed sounds like a drum." Nor does the flatus shift its place with changes of posture, not even if the part be completely inverted; this is not the case if fluid be present.

After all this, one searches with eagerness to find if there be any mention of the *rhogmoi* or râles described by Hippocrates in diseases of the chest—pneumonia, phthisis, empyema, etc.—and alluded to by Caelius Aurelianus (fifth century A. D. ?) De Morb. Acut. II, 10: "Gutturis Stridor quem Graeci *rhogmon* vocant." They are also mentioned by Paul of Aegina, seventh century, under pneumonia and the operation of laryngotomy, and by the Arabian Rhazes, ninth century, and Psellus, eleventh century. We find the term used by Aretaeus in describing the symptoms of asthma, a name which evidently embraced other affections giving rise to dyspnœa, besides that to which we limit it. "Succussion," or the sound elicited by shaking the body, upon which Hippocrates laid such stress in "empyema," a term which simply meant with him pus in the chest, is not mentioned. On the other hand, in enumerating the symptoms of heart disease, we find among them *"a bruit of the heart."* The Greek word is πάταγος—"πάταγος τῆς καρδίης."[11] This word is used several times by Homer: πάταγος ὀδόντων, chattering of the teeth; πάταγος ὀζῶν, crashing of branches against each other in a wood during a storm; ἐν δ' ἔπεσον μεγάλῳ πατάγῳ, they fell into the water with a great splashing noise. It is also used by others for the rattling of the wind, for the sounds made by animals and musical instruments, etc. Akin to πάταγος are παταγέω, πατάσσω, παταγή, which are employed to express the clapping of hands, the beating of the heart and even thunder.

It is a fact of the highest interest that Aretaeus recognized the murmur of heart disease. And in connection with it we should note that he does not speak of it as an uncommon or striking symptom, one which he had heard on some rare occasion, in some peculiar case. Had this been so, we may rest assured that so careful and conscientious an observer would have so stated. But he includes it among the common symptoms, such as palpitation, vertigo, fainting, pulse failure, etc. And in the same way we may assure ourselves that the murmur of which he speaks was elicited by the application of the ear to the chest. We know that such murmurs are sometimes heard at a distance from the patient, but this is altogether exceptional. Laennec noticed it in several cases, but only at a distance of a few inches. A medical friend heard a loud, humming sound, as he sat by the bedside of a patient, like that of a sewing machine in the adjoining house; he found that it proceeded from an aortic lesion. That such cases are extremely rare I am convinced from a personal experience of over 40 years in hospital, dispensary and private practice, in which I have always given special attention to the heart. The memory is very fallible, yet it is strange that not a single such instance remains impressed upon mine, nor do I find any mention of it in several of our most popular text-books, which surprised me very much, for of course I know there had been

[11] Adams, *op. cit.*, pp. 30, 271.

such cases. Nor is it strange that so acute a diagnostician as Aretaeus should extend to the heart the method which had enabled him to elicit the *rhogmoi* in affections of the lungs, and with which he was made so familiar by the well-studied writings of his revered predecessor—Hippocrates—the gospel of the medical profession of his day. It is a fact, however, that Aretaeus is the only one of the ancient writers, so far as I know, who auscultated the heart.[12]

The therapeutics of Aretaeus are copious and varied, offering a striking contrast to Hippocrates who has comparatively little to say on medical treatment. In the classification of his remedies we find acids, alkalis, stomachics, antidotes, calefacients, refrigerants, emetics, purgatives, astringents, stimulants, diuretics, nervines, etc., and locally venesection, leeches, cups, clysters, friction, massage, sternutatories, gargles, cataplasms, fomentations, epithems, blisters, ointments, baths, arteriotomy, the catheter, the cautery, irritants, hemostatics, etc. Some of his individual remedies are: absinth or wormwood, a stomachic; dates, an astringent; Samian and other earths, galls and starch, coagulants; wine, a stimulant (not to be used in inflammations); castor and asafœtida, nervines; cantharides used in making blisters; spiders' web, a hemostatic, used in checking hemorrhage from leech bites, etc.; mustard, an irritant; hiera of aloes, and hellebore, purgatives—white hellebore expelling yellow bile and black hellebore, black bile. He uses various sorts of baths, hot, cold, sea, sand, sulphurous, etc., and recommends various forms of exercise, active and passive, chironomy, walking, leaping, riding, sailing, vociferation, massage, throwing the *halteres,* etc.

In the treatment of disease, venesection fills a very prominent rôle. There is hardly a disease in which it is not recommended. Believing the "blood is the pabulum of inflammation," which is a very frequent condition, it is quite natural to attempt to check disease by removing it. Aretaeus is always cautioning, however, against its too free loss. The quantity to be drawn is to be regulated by the strength. It is difficult to determine the amount and mistakes are easily made. If you take too much you dispatch your patient, "for blood imparts vital heat to the body and to the food." It is better to err on the side of smallness, for if you have not drawn enough, you can open a vein again. In some cases venesection is urgently called for as in pleurisy and pneumonia. In the latter blood should be taken from both arms at once, so that revulsion of the humors may take place from both sides of the lungs; but we must not carry it to *deliquium animi,* for that co-operates with the "suffocation." For if the exciting causes be from the blood the venesection removes them, but if from phlegm or froth or any other of the humors, the evacuation of the veins widens the area of the lungs for the passage of the breath. In affections of the heart we must take much less than in any other case, for here even a slight mistake will send a patient to Hades. The greater the disease the more imperative does the great remedy—*μέγα βοήθημα, μέγα ἄχος*—as he calls it, become. This applies to those affections which involve the brain—apoplexy, kephalæa, epilepsy. Epilepsy was especially subjected to heroic measures. "Whatever is great and most powerful is needed for epilepsy. Blood is to be taken from the veins at the elbow, the straight vein at the forehead, and by cupping, but still not to the extent of *deliquium animi,* for that has a tendency to induce the disease. The arteries before and behind the ears are to be opened or portions of them excised, and purgings, which are still more potent measures, are to be produced by medicines which draw off phlegm from the head." The medicine should be particularly powerful, for the habits of such persons renders them tolerant of pains and their goodness of spirits and good hopes render them strong in endurance. Blistering the head with cantharides and even trephining the skull are recommended. He enunciates the same doctrine under the disease elephas (elephantiasis): "the remedies ought to be greater than the disease in order to procure relief."[14] I believe ileus is the only

[12] Hippocrates called any collection of pus within the chest empyema. Abscesses of the lung were not infrequent, according to him. Their discharge gave rise to vomicæ or cavities. This discharge might occur in either of two directions: 1, into the bronchi, followed by expectoration; or 2, into the pleural cavity. The former he considered a fortunate issue. Hippocrates does not say, as has been affirmed, that succussion is a constant symptom of pus in the chest. *We* know that it does not occur in simple collections of water or pus in the pleura. It is, however, common in pneumo-hydro and pneumo-pyothorax and according to Laennec may be heard in large cavities half filled with fluid. Hippocrates noticed that it was absent where pus was retained (true empyema), for he says: "Those who are full of pus yield no sound." This seems to point to his success in its practice as being due to the fact that he applied it in conditions where air was present. Yet he does not appear to have been aware of the condition pneumothorax (Laennec). It is interesting to note that between 1819 and 1826—about 6½ years—Laennec found the symptom succussion in 30 cases and also knew of many other cases in the hospitals of Paris. Hippocrates describes succussion as follows: "Having placed the patient in a firm seat, cause his hands to be held by an assistant and then shake him by the shoulder in order to hear on which side the disease shall yield a sound." *De Morbis.* II, 45. That Hippocrates did actually apply his ear to the chest is clearly stated, for in the treatise *de Morbis,* II, 59, in speaking of diagnosticating collections of fluid within the chest, he uses these words: *Πολλόν χρόνον προσέχων τό οὖς πρός τά πλεῦρα.* This passage seems to have entirely escaped the observation of his successors. Even Laennec had read these words without heeding them. May not the great discovery of the latter have been due more to the words of the great father of medicine still echoing through the chambers of his brain, "applying the ear to the chest," rather than to the happy accident or inspiration to which he ascribes it? In evacuating fluid when it protrudes between the ribs, Hippocrates says the incision should be made low down, "at the point where the râle is heard"—*ὁπῃ ἂν ψοφέῃ.*[13] Hippocrates is said also to have practiced percussion; I am not able as yet to verify this statement.

[13] De Morbis. Lib. II, Sec. 5 (Foes Edition, Vol. I, p. 483).

[14] "Well, in my opinion, did Aretaeus, the Cappadocian, say that the power of remedies ought to be greater than those of diseases; and that for this reason elephantiasis is incurable, because it is impossible to find a medicine more powerful than it. For if cancer, which is, as it were, an elephantiasis in a particular part, is ranked among the incurable diseases by Hippocrates himself, how much more is not elephantiasis incurable, which is, as it were, a cancer of the whole body."—*Paulus Aegineta (Adams), II, 1.*

disease in which bleeding *ad deliquium animi* is recommended by Aretaeus.

Cupping is often to be preferred to venesection, having the advantage of not reducing the strength. Both dry and wet methods were used, the former acting by revulsion of matters from within. In protracted apoplexy blood should be abstracted unsparingly from the back of the neck. The benefit from cups was especially marked in pleurisy.

Unusual forms of venesection were those from the lingual veins—the tongue being pressed upwards against the roof of the mouth—in obstinate cases of inflammation of the throat, which, if the blood flows freely and copiously, proves more effectual than all other means; from the nostrils in head affections by means of a long instrument called *κατειάδιον* or by a *τορύνη* (a sort of scoop), which is thrust into them, or if these be wanting, by a goose quill, made rough at the end like the teeth of a saw, which is pushed down to the ethmoid cells and the veins there roughly scratched or scarified; and from the veins of the forehead, pubes, ankle and back of the hand.

Next to venesection and cupping came purgatives, among which the most powerful were elaterium, the hiera of aloes, and hellebore. The last named was a sort of *dernier resort;* if all other remedies failed in chronic diseases, the white hellebore was the only cure. In first attacks of gout it was "the great remedy."

Clysters were used to evacuate the bowel and to produce revulsion of humors from the head, chest, etc., in affections of those parts. There were two sorts of clysters—as mentioned under quinsy—one, the common clyster, to bring away feculent matter; the other to produce revulsion of the humors.

I will now give some details of treatment of individual diseases.

Dropsy is relieved by hydragogue purgatives, sweating and diuresis. Tetanus is treated by asafœtida. Soothing fomentations are applied in pleurisy. In spitting of blood he recommends ligatures to the arms and legs by broad bands firmly applied, which appears to indicate that he understood the direction of the blood-flow in the veins.[15]

In heart disease, "the patient must be stouthearted and courageous, and the physician must encourage him with words to be of good cheer and assist with diversified food and drink. . . . . Let him lie in cool air and in a house having a northern exposure, and if the cool breeze of Boreas breathe upon him" [he is here quoting from Homer, where he speaks of wounded Sarpedon][16] "'it will refresh his soul sadly gasping for breath.' The prospect should be towards meadows, fountains and babbling streams, for the sweet exhalations from them, and the delightful view will warm the soul and refresh nature. And, moreover, it is an incentive to eat and drink. But if, from want, one is not fortunate enough to possess these things, we must make an imitation of the cool breeze, by fanning with the branches of fragrant boughs, and if the season be spring, by strewing the ground with such leaves and flowers as are at hand." And then he enumerates other measures to be employed and concludes: "By these means the patient is to be brought back to convalescence and his accustomed habits."

In phrenitis, sleep is to be secured by the application of poppy fomentations and by stroking the temples and head.

He treats phthisis by life at sea, "for the sea-water contributes something desiccant to the ulcers," by riding, by anointing with oil, by milk, whose praises he sounds in strong language, and by raw eggs.

In epilepsy he considers diet very important. No flesh is to be allowed. Castor is the best remedy. He has never tried the brain of a vulture, the heart of a raw cormorant, and the weasel, alleged remedies. He has seen persons holding cups beneath the wound of a man recently slaughtered and drinking thence draughts of human blood. "O the mighty necessity," he exclaims, "which compels one to practice such a wicked abomination. And whether even then they recovered, no one could tell me for certain. There is another story of the liver of a man being eaten. However, I leave these things to those who care to try them."

There are few allusions to surgical operations, but enough to make us realize how much we miss by the loss of his work on that subject. He refers to this treatise in connection with some remarks on abscess of the liver and its treatment. He recommends urethrotomy for stone impacted in the neck of the bladder. In suffocative quinsy, which is evidently laryngeal diphtheria, he is opposed to tracheotomy, "for the heat of the inflammation is increased by the wound, and thus contributes to the suffocation and cough; and, moreover, should the patient be so fortunate as to escape, the lips of the wound will not coalesce, being cartilaginous and of a nature unfavorable to union."

Some of his sentences are epigrammatic, recalling the terseness and force of the aphorisms of Hippocrates: "It is impossible to make all the sick well, for the physician would in that case be superior to the gods; but the physician can secure respite from pain and intervals in disease, and can render diseases latent." "Few escape from dropsy, and they more by fortune and the gods than by art; for all the greater ills the gods only can remedy." "For the strength of nature produces health, but her weakness disease." "This is a mighty wonder, that, in hemorrhage from the lungs, which is particularly dangerous, patients do not despair, even when near their end. The insensibility of the lungs to pain appears to me to be the cause of this; for pain even when slight makes one fear death. In most cases pain is more dreadful than pernicious, whereas the absence of it, even in serious illness, is unaccom-

[15] It is one of the strangest things in all medical history that for centuries physicians were bandaging the arm in practicing venesection and yet never realized the direction of the blood current in the veins. Even Harvey's teacher, the Paduan anatomist, Fabricius ab Aquapendente, although he wrote a work on The Valves of the Veins, believed that the blood flowed from the heart to the extremity, although it distends the veins on the *distal* side of the bandage. In his opinion the valves were designed to delay the blood and prevent the whole of it flowing at once to the hands or feet and becoming collected there. See Foster, *op. cit.*

[16] Il. V, 697.

panied by fear of death and is more dangerous than dreadful." "One must be fertile in expedients and not be satisfied to apply his mind entirely to the writings of others." "Experience is a good teacher, and one ought to try experiments, for too much caution results in ignorance." "If you give a medicine at the height of the dyspnœa" [he is writing of pneumonia], "or when death is at hand, you may be blamed for the patient's death by the vulgar." "To those who suffer such pains" (in ileus), "to die is happiness, yet it is not permitted to the reputable physician to impart it. However, at times, it is permitted to lull the patient asleep with narcotics and anæsthetics, when he foresees that there is no escape from the evil." "When these things are done, if the disease does not yield, the patient's condition is hopeless." "If he vomit up everything" (in cholera), "if the sweat be excessive, if he become cold and livid, if his pulse be almost imperceptible and his strength be exhausted, it will be well to try to make one's escape with credit." I could give many such passages.

His regard for the patient's comfort is shown in the following, which also conveys an important practical therapeutic hint: "Inunctions are more agreeable and efficacious than fomentations; for an ointment does not run down and stain the bed clothes—a thing very disagreeable to the patient—but it adheres, and being melted by the heat of the body, is absorbed. Thus its effects are persistent, whereas liquid preparations run off."

SUMMARY OF RESULTS OBTAINED, AND FEATURES OF INTEREST, IN TWO HUNDRED AND FIFTEEN CONSECUTIVE CATARACT EXTRACTIONS.[1]

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Of the cases included in this summary 100 have been reported in detail heretofore.[2] Like this first series, the 115 eyes since operated upon were in no sense "selected cases." Indeed, five of the cataracts were of traumatic origin, and three of these were complicated by the lodgment of a foreign body within the eye, and one by laceration of the iris, while in one case pulmonary tuberculosis was present, in another diabetes, in another an iridectomy had been done previously for inflammatory glaucoma, and in still another the cataract was hypermature and partially dislocated.

I have felt warranted in excluding six cases from this report, as their inclusion would have marred its statistical value. In three of these there was before operation no light perception, the lens being removed in one to reduce tension, in one for cosmetic effect, and in one to lessen the irritability of the eye blind from irido-choroiditis. In another case there was doubtful light perception, consequent upon an old choroidoretinitis, and though recovery from the operation was smooth vision was not improved. In another the cataract was secondary to extensive detachment of the retina, and in still another, which was of traumatic origin, due to penetrating wound of the ball, the eye was eventually enucleated because of severe and persistent iritis.

Combined extraction, which I regard as the most satisfactory method, was done in 94 cases, extraction after preliminary iridectomy in 17 cases, simple extraction (unintentional) in 1 case, extraction in capsule, without iridectomy (unintentional), in 2 cases, and suction extraction in 1 case of traumatic cataract.

In most of the cases in which a preliminary iridectomy was done the cataract was immature, and trituration of the lens was combined with it; in one instance the iridectomy was done for the control of glaucoma. In two of the preliminary iridectomy cases, owing to complications, the lens was extracted with the "loop."

In all of the operations the section was made throughout in the sclero-corneal juncture, and in nearly all of them a small conjunctival flap was secured. A small iridectomy was made with a single cut with the scissors, the writer's reverse-curved iris scissors (Fig. 1) having been used with much satisfaction for this purpose. The lens capsule was opened



Fig. 1.—Reverse-curve Iridectomy Scissors (about one-half actual size).

freely—a long vertical cut being crossed by a shorter horizontal one. After extrusion of the lens the iris was carefully disentangled from the angles of the section by means of the spatula. Both eyes were closed with sterile pads of gauze and cotton, the eye operated upon being further protected by a Murdoch's shield, the dressing over the other eye being held in place by strips of adhesive plaster. The fellow eye was kept closed until the fourth day; the pad was not removed permanently from the eye operated upon until the seventh day. Strict antisepsis was practised, the instruments and all solutions used being sterilized by boiling, and the hands

[1] A paper read before the American Ophthalmological Society, New London, Conn., July 14, 1909.

[2] Americal Journal of Ophthalmology, Vol. XVI, p. 353.

of the operator and his assistant cleansed by scrubbing and immersion in sublimate solution. Beginning on the second day after the operation, sometimes not until the third day, a daily application of a sterile 4-grain solution of atropine was made to the eye operated upon.

Accidents and Complications.—In the 115 cases not heretofore reported loss of vitreous humor occurred nine times. In five instances this was due to strong contractions of the lids, four occurring in negroes. In one case there was difficulty in delivering the lens, in one the loop was used, and in two cases the cause was not apparent. In the first hundred cases vitreous was lost six times.

In one case, after a smooth operation, the patient, in taking a dose of trional, had a spell of choking and coughing, which brought on a severe intra-ocular hemorrhage. Hernia of the vitreous humor followed, and, though suppuration was avoided, the result was a failure—only light perception being retained.

In endeavoring to secure a small coloboma, it happened in several cases that the pupillary margin of the iris was not excised, a "button-hole" iridectomy being the result. In no instance did this seem to interfere with the success of the operation. Several times, too, the iris protuding in front of the knife was cut during the completion of the corneal section; but, while this made an ideal iridectomy difficult or impossible, it was in no case followed by serious consequences. In one instance, in which it was difficult to seize the iris, due probably to exceptionally wide mydriasis from the cocaine, the iridectomy was done after delivery of the lens. It so happened that the best visual result of the series was obtained in this case. There were 15 cases in which discission of capsular opacity was performed, and in one of these a second discission was necessary. There were a number of cases of mild iritis, and three cases in which the iritis was so severe as to require a secondary iridectomy, the ultimate visual result in these cases being $\frac{20}{C}$, $\frac{20}{CXXV}$ and $\frac{20}{CC}$ respectively.

Summary of Results.

Successes $\left(V=\frac{20}{CC}\text{ to }\frac{20}{XV}\right)$	95
Successes (V not recorded)[3]	8
Total successes	103
Partial successes $\left(V=\frac{6}{CC}\text{ to }\frac{18}{CC}\right)$	6
Partial successes (V not recorded)	1
Failures from suppuration	2
Failures from other causes	3
	115

The visual acuity obtained in the successful cases, omitting the eight cases in which it was not recorded, and taking the best vision in each, whether before or after discission of capsular opacity, was as follows:

$\frac{20}{XV}$	1	$\frac{20}{LXXV}$	2
$\frac{20}{XX}$	2	$\frac{20}{LXXX}$	4
$\frac{20}{XXV}$	3	$\frac{20}{XC}$	6
$\frac{20}{XXX}$	15	$\frac{20}{C}$	14
$\frac{20}{XL}$	18	$\frac{20}{CXX}$	3
$\frac{20}{XLV}$	3	$\frac{20}{CXXV}$	2
$\frac{20}{L}$	8	$\frac{20}{CL}$	1
$\frac{20}{LX}$	1	$\frac{20}{CC}$	7
$\frac{20}{LXX}$	5	Total	95

Of the cases designated in the above summary as "partial successes," the poor vision obtained was due in one to the patient (a negro) contracting the lids so strongly just before delivery of the lens as to cause a loss of about one-fourth of the vitreous humor $\left(V=\frac{10}{CC}\right)$; in one (also a negro) through similar behavior forcing out the lens and a considerable quantity of vitreous $\left(V=\frac{10}{CC}\right)$; in one, in which there was a smooth recovery, to antecedent choroidoretinitis $\left(V=\frac{6}{CC}\right)$; in one to antecedent syphilitic iridochoroiditis $\left(V=\frac{16}{CC}\right)$; in one to an old uveitis, for which I had previously performed an iridectomy (V unrecorded), and in one case, in which $V=\frac{18}{CC}$ was obtained, the cataract was caused by a blow from a whip, and was complicated by laceration of the iris.

Of the five "failures" two, as indicated, were due to infection, with resulting purulent panophthalmitis. One of these occurred in a woman 80 years of age, in feeble health, an inmate of the Home for Incurables. The operation was performed at the Baltimore Eye, Ear and Throat Hospital, and the usual antiseptic precautions were observed. The conjunctiva tore under the grasp of the fixation forceps, and for this reason the corneal section was made with difficulty, and was somewhat smaller than was intended. Counter-pressure was required to effect the delivery of the lens, and when it rather suddenly slipped out there was a small loss of vitreous. A crater-like depression of the cornea followed, and this had not entirely disappeared when the permanent dressings were applied, after a delay of a quarter of an hour. More than the usual amount of pain followed the operation, and on the third day it was evident an infection had occurred. The eye was subsequently enucleated.

The other infection happened in a man about 74 years of age, in poor health, and of unsound mind. The cataract was fully mature and was very black, and, it seemed not improbable, was secondary to disease of the deeper eye-tunics. I had operated upon the other eye four years before (No. 68

[3] The history notes of these cases showed smooth recoveries, but for various reasons, chiefly because the patients did not report for adjustment of glasses, no record of vision was obtained.

of previously published series), and this eye (otherwise diseased) was also lost by infection. It is worthy of note, therefore, that this one individual furnished just half of the four infections which occurred in the whole series of 215 operations.

Because of this previous experience, I had, as a precaution, performed a preliminary iridectomy upon the second eye. The nucleus proved to be exceptionally large, and for this reason, though a good corneal section had been made, its delivery was a little difficult. However, no vitreous was lost, and the outlook seemed altogether promising. After the operation the patient complained continuously of pain, and three times tore off the dressings, twice during the second night. Within 48 hours a purulent panophthalmitis set in and the eye, of course, was lost.

Of the three "failures" due to causes other than pyogenic infection, one, resulting from post-operative hemorrhage, has already been described.

Another occurred in a man 86 years of age, who was in fairly good health. A broad arcus senilis was present, and the iris was very light in color. Adrenalin (1:1000) was used in conjunction with the usual 4 per cent cocaine solution. The cornea collapsed after completion of the section, and it was impossible to see the light-colored iris. Probably, owing to exceptionally wide mydriasis, it was equally impossible to seize the iris; so, after several ineffectual efforts to accomplish this, the capsule was opened and the lens delivered without the performance of an iridectomy. Collapse of the cornea followed, but the edges of the section being in good apposition the dressings were applied. The cocaine was not used oftener nor for a longer time in this case than usual, and it seemed altogether probable that the unfavorable conditions produced were due to the added effect of the adrenalin. At all events, I have never since ventured to use it in operating for cataract.

Undue inflammation, suggestive of non-pyogenic infection, followed, and involved the anterior portion of the vitreous body as well as the iris. During convalescence the patient fell and fractured the neck of his femur. On this account he was removed to a general hospital, where I saw him some weeks later. He was then able to see the hand by reflected light, and there seemed to be a chance of improving vision by a secondary operation. He was not, however, heard from again.

The third case of failure from causes other than pyogenic infection was to me of especial interest: A negro woman, who gave her age as 56, but was probably older, had a somewhat hypermature cataract in the right eye, and a not fully mature cataract in the left eye. A smooth operation (combined extraction) was done upon the right eye. The result was entirely satisfactory, except that there was some entanglement of the iris in one extremity of the corneal section, and within five weeks she had in this eye $V = \frac{20}{XXX}$. She was anxious to have the other cataract removed before leaving the hospital, and, contrary to my usual practice, I operated upon the left eye three weeks after the date of the first extraction. The operation was smooth, and when the eye was inspected on the second day its condition was most promising, there being very little cortex in the pupillary area. Some days later the right eye became injected, and then the left eye began to do badly, and before long a severe and obstinate iridocyclitis was established in each eye. Extensive adhesion of the iris to the vitreous body occurred in both eyes, the *T* of each fell below normal, and in each *V* was reduced to light perception, with no hope of improvement.

That a condition closely akin to sympathetic ophthalmitis was established in this case seems altogether probable, and I feel sure that two successful operations were spoiled because so brief an interval was allowed to elapse between their performance.

Several other cases presented features worthy of mention: A negro, 60 years of age, a truck driver, with a hypermature cataract in one eye, eight days before reporting saw well enough with the other eye to drive his team. Within this brief period, and without signs of inflammation or the occurrence of any traumatism, the lens of the seeing eye clouded so rapidly that *V* was reduced to light perception, and the cataract, though presenting a mother-of-pearl appearance, was recorded as "nearly mature." I may add that I have encountered three other similar cases.

Mrs S., a gentlewoman, 65 years old, after a successful combined extraction upon one eye, the other eye having slight peripheral lens opacity, with a low grade of compound hypermetropic astigmatism and nearly normal vision, wore for several years with entire satisfaction bifocal glasses, which gave her comfortable binocular vision in both far and near. Such an experience, so far as my observation goes, is rare, and it is, perhaps, worth while to give the formula of her lenses:

Right eye +11.s, with +3.75s added for near.

Left eye +.62s +.37c 85°, with +3.50s added for near.

With these the *V* of the right eye was $\frac{20}{XX}$; of the left eye $\frac{20}{XXV}$ (?), and of the two eyes $\frac{20}{XX}$, missing one letter.

Mrs. H., about 70 years of age, had had a successful extraction operation performed upon the left eye. A combined extraction was done upon the right eye, with good result; but when an attempt was made to adjust glasses to the two eyes intolerable vertical diplopia resulted, and it was found that a downward squint had developed in the right eye during the time that it was not in use. To overcome this diplopia a 5° prism, base up, before the right eye was necessary, and this effect was obtained by decentering the lens. The point of interest is that in a little more than six weeks the hyperphoria had almost entirely disappeared, and the patient was actually more comfortable without the prismatic correction which so short a while before was urgently demanded.

In the 100 extractions heretofore reported there were, as has been indicated, two eyes lost from suppuration, giving a total of four for the whole series of 215 cases—slightly less than 2 per cent. There were, also, two eyes in which *V* was

not improved, though recovery from the operation was smooth, the negative result in one being due to pre-existent extensive retinal detachment; in the other to an old syphilitic iridochoroiditis. There were six partial successes and 90 successes.

Combining the results of the two series we have:

General Summary.

Successes (V $\frac{20}{CC}$ to $\frac{20}{XIII}$)	178
Successes (V not recorded)	15
Total successes	193
Partial successes (V $\frac{6}{CC}$ to $\frac{18}{CC}$)	10
Partial successes (V not recorded)	3
V not improved, though recovery from operation was smooth	2
Failures from suppuration	4
Failures from other causes	3
Total operations	215

The seven failures recorded represent a loss of slightly more than 3.25 per cent.

The visual acuity obtained in the successful cases, omitting the 15 cases in which it was not recorded, was as follows:

$\frac{20}{XIII}$	1	$\frac{20}{LXXV}$	6
$\frac{20}{XV}$	1	$\frac{20}{LXXX}$	7
$\frac{20}{XX}$	4	$\frac{20}{XC}$	6
$\frac{20}{XXV}$	3	$\frac{20}{C}$	22
$\frac{20}{XXX}$	31	$\frac{20}{CXX}$	7
$\frac{20}{XL}$	25	$\frac{20}{CXXV}$	2
$\frac{20}{XLV}$	3	$\frac{20}{CL}$	1
$\frac{20}{L}$	19	$\frac{20}{CC}$	14
$\frac{20}{LX}$	10	Total	178
$\frac{20}{LXX}$	16		

CORRESPONDENCE.

New York, October 19, 1909.

To the Editors, Bulletin of the Johns Hopkins Hospital.

Gentlemen: If the Review of my book, "The Surgery of the Ear," which appeared in the October number of the Johns Hopkins Bulletin only contained the opinions of the Reviewer on the material of the book, then I would perforce be obliged to accept his opinions without further comment. But, as on the one hand, the Reviewer charges me with inaccuracy in my anatomical notes, and on the other hand, mis-states my arguments, giving your readers an incorrect impression of my views, therefore, I ask indulgence and space to place my answer before your readers.

In the matter of anatomy, my use of the term "aditus ad antrum," rather than the term "attic" or "recessus epitympanicus," finds confirmation as to its correctness of usage by some of the best anatomists, and Siebenmann on page 276 of Bardeleben's Handbuch der Anatomie des Menschens: Sinnesorgane, Abteilung II, gives the reasons why the use of any other term than that of "aditus" is incorrect from the anatomic, the embryonic, clinic and even the pathologic side. V. Troeltsch, Eysell, Schwartze and others have used the term as I have done. Besides, I placed the words "attic" and "epitympanic space" in parentheses, next to the term "aditus."

Regarding the relative angle of the membrana tympani to the axis of the external auditory canal, your Reviewer does not read me correctly. I do not give the angle of the membrana tympani to the axis of the external auditory canal. I give the angle formed by the inclination of the drum head to that of the superficies meatus or squamosa. Furthermore, the angle referred to by the Reviewer is still a mooted question. The right is certainly mine to believe the findings of Henle, v. Troeltsch, Gruber, Merkel, Tillaux, and also Schwalbe. I was not, and I am not unaware of the more recent work on this point by Poirier, but after studying the question myself, and reading Siebenmann's investigation of ten skulls at birth, I hold the newer view as not yet proven, and certainly am entitled to place the more generally accepted view in my book without being charged with inaccuracy.

In the matter of mis-statements by the Reviewer, I beg to refer to his quotation, that I advance the argument of "sudden and transient mania" against early ligation of the internal jugular vein in cases of sinus thrombosis. On page 232 of my book, under a caption *Untoward Sequalæ*, I report among other unusual happenings after resection of the jugular "sudden and transient mania," quoting from a report among others, of Dr. John D. Richards. I remark at the end of the paragraph, that I had seen sudden and transient mania follow operations on the mastoid where *no* operative work was done on the blood vessels, giving the best I could find in the literature reporting such cases. I am at a loss to understand how this could be construed into the meaning the Reviewer uses as my arguments.

Finally, in regard to the reasons that the Reviewer assigns to me for my failure to get good results from the use of the blood clot after-treatment, I beg to refer to page 97 of my book where I distinctly state my reasons for the failures. Again, the inspection of the skin wound, by removal of the outside dressings is hardly meddlesome surgery. It is a procedure performed regularly at our hospitals, after primary suture of the skin after radical mastoid surgery, and has never given harmful effects. The reasons why I do not curette the mastoid antrum in the infant and young child are given on page 109. The Reviewer has taken a sentence from this page and placed it in juxtaposition to another from under the caption *Blood Clot After-treatment* and leaves the reader of his article under the impression that I was discussing one and the same subject. Here again, like the other mis-statement of my views there is an injustice to my opinions as distinctly given in the book, since I certainly neither believe nor advocate meddlesome surgery, nor do I advocate neglect to properly cleanse the antrum. If I do not curette the antrum in the infant and young child, I give my reasons for my procedure, and surely an author has a right to express his opinions in his book.

Respectfully,

S. J. Kopetzky.

Baltimore, October 25, 1909.

To the Editors of the Johns Hopkins Bulletin.

Gentlemen: In answer to Dr. Kopetzky's letter, I beg leave to mention only the following points:

First, his explanation of the use of the term "aditus" does not answer my criticism; I objected to his use of the words aditus

and attic as synonymous, whereas they refer to different portions of the midde ear space.

Secondly, regarding the angle of the tympanic membrane, I have no objection to his adherence to the old view thereof but I think the most recent anatomical work tends to show that he is in error.

Thirdly, as to post-operative mania being an argument against ligation of the internal jugular vein, perhaps I attributed a greater importance to that portion of his argument than the author intended; on re-reading the paragraph referred to I find that the statement is not as emphatic as I at first considered it.

Fourthly, as to the question of dressing the mastoid wounds and the effort to secure primary healing, I adhere to my previous statement. On page 109 the author describes his treatment of the antrum, as I referred to it, and my next quotation *docs* follow in logical sequence for, the remainder of page 109 and pages 110 and 111 are devoted to the technique of operation and the findings within the diseased area, pages 112 and 113 to the after-treatment when dressed in the ordinary way and page 114 to the after-treatment when the blood-clot dressing is applied; if considering the blood-clot treatment of mastoidectomies upon children, pages 109 and 114 must be read together. That the advice contained therein, to investigate the blood-clot dressing daily, is of a meddlesome nature is shown, I think, by the author's own advice regarding the treatment of the packed wound; on page 112 it is advised not to change the dressings, unless compelled to by untoward symptoms, earlier than the fifth day and on that and the following page it is explained that early or frequent dressings afford the possibility of infecting a clean wound. If that advice is correct for this class of cases it is doubly important to emphasize it when striving for primary union.

Very truly yours,

H. O. R.

NOTES ON NEW BOOKS.

Aseptic Surgery. By Charles Barrett Lockwood, F. R. C. S. Third edition. Price $1.50. (*London: Henry Frowde and Hodder & Stoughton.*) *Oxford Medical Publications.*

This work, which was published first but a short time ago, has met with deserved success. It is an excellent clear exposition of the principles underlying asepsis, good both for nurses and younger medical students. Though the English practice does not correspond closely to the American in many details, yet the principles are the same, so that the book can be read with as much advantage in this country as abroad. But no book will teach students how to practice asepsis thoroughly; this can only be learned satisfactorily in the operating rooms.

Children in Health and Disease. A Study of Child Life. By David Forsyth, M. D., D. Sc., Physician to the Evelina Hospital for Sick Children. Price $3.00. (*Philadelphia: P. Blakiston's Son & Co., 1909.*)

This volume attempts to deal with childhood, both in health and disease, from a scientific standpoint. The author presents his facts clearly and does not content himself with giving dogmatic statements in reference to baby feeding, the conditions of infant life and the examination of sick children merely, but presents other admirable chapters upon the anti-natal and post-natal physiology of children, the psychology of infants and children, the hygiene of schools and school life and the medical aspects of the latter, the medical inspection and supervision of school children, the training of children and the education of defective children. While all of the volume is admirable, the chapter on the training of children is especially to be commended to all who have to do with children. The author believes that the training of children should be to assure their bodily health and to shape and form their characters no less. The first step in their moral training should be the inculcation of implicit obedience to constituted authority until the primitive canons of conduct become ingrained and crystalize into thought and action. Later, when a sense of right and wrong has become habitual and an appeal can be made to the child's sense of honor, habits of independence and self-reliance may be inculcated. The author says: "Not until health and character exist as sufficiently sure foundations on which to build up intellectual training should we give prominent attention to those subjects, a knowledge of which will serve to fit the child for a working place in the world. The trained mind is not the one which has absorbed the greatest amount of information, but the one that has found the exact use of its own contributory senses and sound judgments. To attain this end a long pupilage is necessary and it must be planned on natural lines that will call into play all the channels of sensory information and the responsive muscular actions. As an important item in this training we must supplement the experiences of the young mind with observations made by others—that is to say, by the study of books. The environment of the child will thereby be widened to an extent which is possible by no other means. At first the mental training should not concern itself with the probable adult occupation of the child, but should be devoted only to imparting that knowledge which is of general applicability and is necessary to every one. Later on somewhat more special bias may be given to the instruction, but not until the general training has been completed should the future occupation of the child be allowed to cast its shadow on his educational course. The author criticizes severely the undue prominence which is given to the acquisition of facts in the modern scheme of education, facts such as the "heights of mountains, historical dates, populations, lists of proper names, exports and exceptions to sales," which produces a disproportionate hypertrophy of the memory. He believes that the prize-winners and gold-medalists have not attained the greatest successes in life and that the qualities which are most serviceable in the examination-room are not of the highest value in after life. He divides the educational period of children into three stages: first, that of spontaneous education, in sight and touch, accurate muscular movement and motor training, etc.; second, that of disciplinary training in school and at home, with a maximum of nature study and a relatively small amount of book-work; and third, the period of adolescence when conscience can be appealed to, discipline can be relaxed and the reasoning faculties can be developed. This chapter is worthy the careful study of all parents and teachers, giving as it does rational views as to education and presenting an aspect of child-training which is wholly neglected by the majority of those who have to do with children.

The chapters on the special care of sick children are also very valuable, but space will not permit a detailed reference to them.

Higher Frequency Currents. By Frederick Finch Strong, M. D., Instructor in Electro-Therapeutics at Tufts College Medical School, Boston. Price $3.00. (*New York: Rebman Company, 1908.*)

The author of this treatise has been engaged for the past ten years in the clinical and laboratory study of the various types of high frequency currents. This volume is the result of his studies and observations. The first chapter is entirely historical and gives one an excellent résumé of the subject from the time when electricity was first used in medicine to the present time.

The author then goes on to describe exhaustively the physics of

high frequency currents and the various methods for the production of such currents. The remainder of the book is devoted to the application of these currents and the therapeutic effects produced. The author, in writing of the remarkable curative effects, explains them upon the assumption that "We have in these currents a rough counterfeit or substitute for the peculiar nutritive flux transmitted through the nerves to all tissues of the body to which we give the name 'trophic influence.' It is this trophic power which enables the cells to absorb their quota of nutriment from the blood, to maintain their vital resistance and to perform their various functions." In another place the author writes: "The vitalizing and invigorating effects of high frequency treatment are necessarily beneficial in all diseased conditions."

From these quotations we are not surprised to find that the author extends the application of high frequency currents not only to disorders of the nervous system, but also to diseases of the digestive, circulatory, respiratory, excretory systems and even to diseases of an infectious and malignant character.

Progressive Medicine. Vol. II, June, 1909. (*Philadelphia and New York: Lea & Febiger.*)

Clark, Coley, Foote, Jackson and Stengel, respectively, contribute chapters on 1, Gynæcology; 2, Hernia; 3, Surgery of the Abdomen, exclusive of Hernia; 4, Ophthalmology; and 5, Diseases of the Blood, Diathetic and Metabolic Diseases, Diseases of the Spleen, Thyroid Gland and Lymphatic System. All the chapters appear to be brought well up to date, and the discussion of the literature is excellent.

International Clinics. Vol. II. Nineteenth Series, 1909. (Philadelphia and London: *J. B. Lippincott Company.*)

Dr. Peter Daniel, of London, has written a long and valuable article on Congenital Idiopathic Dilatation of the Colon, which is splendidly illustrated with some X-ray photographs, for this volume. It will interest not only surgeons, but general practitioners, for these cases are usually seen first by the latter. Another paper well worthy of attention is Dr. Shoemaker's, of Philadelphia, on "Immunization Against Typhoid Fever," a subject that has not received as much study as it deserves in this country. To those who know the "Clinics" it is unnecessary to point out their merits, and for others it is only needful to note their broad scope and general excellence. Twenty authors, English, French and American, are represented here by twenty different papers on Treatment, Medicine, Surgery, Psychiatry, Pathology, etc., so it is seen that the articles range widely and appeal to various tastes.

The Open-Air Treatment of Pulmonary Tuberculosis. By F. M. Burton-Fanning, M. D., F. R. C. P., London Physician to the Norfolk and Norwich Hospital. Second edition. Price $1.50. (*New York: Paul B. Hoeber, Publisher, 1909.*)

This modest volume of less than two hundred pages furnishes an excellent guide to the treatment of tuberculosis and deserves a wide circulation among general practitioners. The author is conservative as to the advantage of the Calmette and von Pirquet tests and does not think that these tests should be relied upon wholly in attempting to diagnosticate early tuberculosis, but that every bit of available evidence should be used in clearing up a diagnosis.

He recommends complete rest in bed as long as the patient shows any increase in body temperature above 99° F. at any time of the day. He also recommends confinement to bed as a preliminary measure of treatment in all cases. He has sensible ideas about acclimatizing patients to open-air life and would accustom the patient to such a life gradually. He is not wholly certain wherein the advantages of open-air life consist. There is undoubtedly a higher bacterial content in all confined air and hence a greater degree of freedom of respiration in the open air. He further considers that the motion of the air exercises a beneficial influence on health as is suggested by the exhilaration felt from passing rapidly through the air and during the prevalence of certain winds. He has no doubt of the beneficial action of the open air in the treatment of consumptive fever. He goes so far as to recommend that when in consumptives the fever does not subside under partial open-air treatment to push the open-air treatment to the extent of having the patient out of doors continually.

He speaks upon the whole favorably of Wright's method of obtaining the opsonic index with a view to immunization and seems to prefer the method to the use of tuberculin. This does not correspond with the experience of hospitals in the United States.

The chapter on diet is unusually full and satisfactory. The book as a whole is sensible and judicious and can be recommended heartily.

Tuberculosis. A Preventable and Curable Disease. By S. Adolphus Knopf, M. D. (*New York: Moffat, Yard & Co., 1909.*)

For many years Doctor Knopf has distinguished himself by the zeal and enthusiasm he has displayed in the propagation and popularization of our knowledge about tuberculosis. Every one has come to admire the ready and genial spirit with which he has answered the numerous exacting demands made upon his time and energy. The present book is in the manner of his popular talks with which all are familiar. It covers a large field, and for the most part satisfactorily. Its plan is a broad one, executed clearly and with spirit. It appeals to a varied audience and there is no one who will read it without acquiring much valuable information. The innumerable side channels of the tuberculosis problem are all explored and indeed these form the most interesting part of the work. The remarks on proper housing, on the duties of the municipality and on the safeguarding of the health of children are especially apt. It is difficult to name any of the even less important contributing factors in the development of tuberculosis that are not mentioned. The matter can be easily understood by laymen and is entertainingly and agreeably presented. The cause of tuberculosis will be greatly furthered if Knopf's book gains the popularity its importance and interest deserve.

The Malarial Fevers, Hæmoglobinuric Fever and the Blood Protozoa of Man. By Charles F. Craig, M. D., Captain Medical Corps, U. S. Army. Illustrated. Price $4.50. (*New York: William Wood & Co., 1909.*)

No one desiring to make a thorough study of these diseases will be able to do without this work, which is the first exhaustive book on the subject in the English language, and an excellent one. Dr. Craig is to be complimented on having written a work which will long stand as an authority. He has had more experience than anyone else in this country with these diseases, and now presents to the profession a long-wanted treatise. It is thorough, well compiled and written and quite up to date. It is to be hoped that it will be widely read and studied, for with its aid fewer mistakes in the diagnosis between malaria, typhoid fever, pneumonia and other diseases will be made. The author is a master of his subject and his own personal observations have added to our knowledge of these fevers. His work is not simply a compilation of that of others, but he has used their work well, and here is to be found practically all that is known concerning malaria. The chapters on hæmoglobinuric fever and the protozoa are added as aids to the study of malaria, and the latter is brief and not intended to be exhaustive in any respect. The work really is devoted to malaria in all its forms and is the best description extant of this disease in English. In a second edition, which will doubtless be soon called for, a number of misprints should be eliminated and more

system be used in the abreviations of the titles of articles referred to in the literature. Attention is merely called to this point, as the book is so good that it is a pity that easily corrected errors should have been overlooked.

Report on Plague in the Gold Coast in 1908. By W. J. SIMPSON, M. D., etc. Price 2/. (*London: J. & A. Churchill.*)

To the Under Secretary of State for the Colonies we are indebted for this valuable addition to the literature on plague. Dr. Simpson has made a very careful study of its outbreak at Accra, and a summary of important facts in connection with it is as follows:

"1. The occurrence of bubonic and pneumonic plague in Accra during the first outbreak with a plague epizootic among the rats.

"2. The extension and prevalence of the pneumonic form of the disease beyond Accra to the exclusion of the bubonic.

"3. The prevalence only of the pneumonic form in the second and third outbreaks in Accra.

"4. The spread of the pneumonic form in Accra and in other localities without rat or flea infection.

"5. Numerous cases of the pneumonic form with ill-defined symptoms."

Medical and Surgical Report of the Presbyterian Hospital, in the City of New York. Vol. VIII, December, 1908.

Almost all of the papers in this volume have appeared elsewhere, but here they are handsomely bound together, and present to students evidence that they would not otherwise be apt to have of the scientific work being done by the staff of the hospital. This is the real value of these publications, and they are to be encouraged. There are twenty-four articles, with many illustrations, covering widely both medical and surgical subjects.

Burdett's Hospitals and Charities, 1909. The Year Book of Philanthropy and Hospital Annual. By SIR HENRY BURDETT, K. C. B., K. C. V. O., etc. (*London: The Scientific Press, Limited.*)

It is a pity that there is no American publication corresponding to this annual, which is of great value to all those interested in hospital administration. It is so much appreciated by hospital superintendents that it needs no special praise or recommendation. This volume contains an especially interesting paper on "The Nursing Department and Its Cost," which is one of the most serious questions to-day to all superintendents. It requires much combined study on their part for its proper solution, as its difficulties are very great in this country, where the number of properly educated women who desire to take up nursing as a profession is not equal to the demand. The statistics furnished annually by Sir Henry on cost of hospital administration are invaluable, as there is no other source of this information. Without the Year Book the gap in our knowledge concerning this point could not be filled.

Department of Commerce and Labor, Bureau of the Census. S. N. D. NORTH, Director. Mortality Statistics, 1907. Eighth Annual Report. (*Washington: Government Printing Office, 1909.*)

Since the last report there has been no increase in the registration area of vital statistics. This is to be regretted, for the United States are of all the large nations the only people without a satisfactory registration of these important figures. The difficulties of a uniform and accurate registration for all the States are great, but not insuperable, and it is to be hoped that with the continued aid of the American Medical Association and other scientific bodies, complete registration will be secured finally.

Perhaps the most astonishing figures in the death statistics are those of typhoid fever. They are a national disgrace. The mortality from this disease in certain cities in Pennsylvania are due to simple carelessness and indifference, if not criminal negligence, on the part of their legislative bodies. No such evil record is to be found in Great Britain or Europe, and we should be ashamed of it, but unhappily are not as a people, any more than we are by our appalling number of railroad accidents, with their killed and injured. There are other towns with similar bad records, but there is more excuse for it there than in Pennsylvania.

There is much of interest in this report in regard to scarlet fever, measles and other epidemic diseases, but until we know more about their cause, it is quite impossible to explain their existence and prevalence in certain places. Undoubtedly with greater precaution by the boards of health, their prevalence might be much diminished.

The value of the report is in keeping before the medical profession and the public at large the need of greater care in the prevention of all forms of disease, which, as has been so often said, is better than the cure.

Handbook for Attendants on the Insane. Fifth edition, revised and enlarged. Published by the authority of the Medico-Psychological Association. Price $1.00. (*Chicago: W. T. Keener & Co., 1909.*)

This English work was published first in 1885 and has met with deserved success. It is intended for both nurses and attendants, and though small in size, is an excellent manual. Its only drawback is that it attempts to include too much. Book I, Section 1, is devoted to Anatomy and Physiology; 2, to General Hygiene and Causation of Disease; 3, to Accidents, Emergencies, First Aid; 4, to General Symptomatology of Bodily Diseases, etc.; 5, to The Nursing of Bodily Diseases. Book II, Section 1, deals with The Nervous System; 2, with the Mind in Health; 3, with the Mind in Disease; 4, with the General Care and Nursing of the Insane; 5, with Diseases of the Nervous System; and 6, with General Duties of an Attendant. There is also an Appendix and Index. It seems as though this was too much to be comprised in one volume of very moderate size. The editors, however, have produced a very serviceable work, especially for asylums where the training schools for nurses are not of the first class; and yet where it is all essential that the attendants should have a simple work to guide them. For this object this book is most excellent, and would be hard to improve upon.

The Medical Annual—A Year Book of Treatment and Practitioners' Index—1909. Twenty-seventh Year. Price 8s. 6d. (*Bristol: J. Wright & Co.*)

The contributors to this annual are both American and English, and with a large number to assist, the progress in the medical sciences during the past year is well described. The work is divided into three parts: I, The Dictionary of Materia Medica and Therapeutics; II, The Dictionary of Treatment; III, Miscellaneous. There is a good index, also a list of the most important medical works published during the past year, and other information of use to the general practitioner. The three parts are arranged alphabetically, so it is easy to turn to any subject under consideration, and find out what new facts about it may have been discovered within a year. The book is well printed on thin paper, supplied with many excellent illustrations and is a useful work of reference.

Transactions of the Society of Tropical Medicine and Hygiene, 1907-1908. (*London: Bedford Press, 1908.*)

This is the first volume of the transactions of the English society, and it is replete with important contributions for the study of tropical diseases. There are papers on the Sleeping Sickness, Malaria, Oriental Sore and its Parasite, Filariasis, Kala-Azar, Dysentery, etc. From the English have already come many important discoveries in the illnesses of hot climates, and with the

formation of this society doubtless others will be made by them, for it has already stimulated still more actively the pursuit of these studies. The transactions of the society are sure to become one of the most important sources of knowledge in this branch of medicine. The report is attractively printed.

Publications of the Massachusetts General Hospital, Boston. Selected Papers by the Staff. (*Boston: The Barta Press, 1908.*)

All of these papers have appeared elsewhere in medical literature, but they have been uniformly reprinted with a consecutive pagination by the hospital and the volume presents a neat appearance and is convenient of reference. It is interesting to read in Cabot's "Complete Removal of the Prostate" that the author has reached the conclusion, after repeated operations, that the perineal operation is to be preferred to the supra-pubic. He believes that the removal of the prostate by the perineal route is more complete, and the danger of complications and hemorrhage also diminished. He gives a report of 65 cases, with two deaths, both due to causes not connected with the operation. Another very valuable and timely paper is Porter and Whites' "Multiple Carcinomata Following X-ray Dermatitis." After reading it one cannot help approving the author's recommendation of "the early excision of all persistent X-ray ulcerations in order that subsequent malignant degeneration may be prevented." The volume as a whole is most creditable to the staff of the Massachusetts General Hospital.

The Herter Lecture (New York, 1908) on the Fluids of the Body. By Ernest H. Starling, M. D., F. R. C. P., F. R. S., etc. Price $2.00. (*Chicago: Keener & Co., 1909.*)

In this extremely interesting book Dr. Starling presents very clearly the whole question of the movements and interchanges of the fluids of the body. In order to do this the physical properties of protoplasm in all their surprising complexity are first considered, especial stress being laid upon the importance of the newer and foreshadowed knowledge of the properties of colloid materials. Upon this basis is built up the discussion of the osmotic relationships of cells and the question as to the part played by the vital properties of the cells as such and as distinguished from mere obedience to physical laws. The various movements of the fluids of the body are taken up in order in a way which involves the discussion of most of the organic functions, so closely do they depend upon these movements and upon the maintenance of a suitable balance of the fluids. The last chapter is devoted to a consideration of the causation of dropsy, in the course of which several perfectly plausible but surprising arguments are brought forward.

The book is very readable, in spite of the necessarily great concentration of so much material into small space and is by far the most satisfactory presentation of the whole subject. Its clearness is rendered more valuable by the fact that much of the original work upon which it is based is Dr. Starling's own.

Principles of Pharmacy. By Henry V. Arny, Ph. G., Ph. D., Professor of Pharmacy, Western Reserve University, Cleveland. Illustrated. Price $5.00. (*Philadelphia and London: W. B. Saunders Company. 1909.*)

There are so many excellent works on these principles that to make a new work acceptable the author must introduce some new feature, and this the author has done by adding a couple of chapters on the chemical theories of inorganic and organic bodies used in pharmacy. These brief résumés will be appreciated by many students of pharmacology. The book is divided into seven parts: I, Pharmaceutic Operations; II, Galenic Pharmaceutic Preparations; III, Inorganic Chemistry; IV, Organic Chemistry; V, Pharmaceutic Testing; VI, The Prescription; VII, Laboratory Exercises. The work as an entity can be recommended. It is clearly written, well arranged and abundantly illustrated; and the publishers have done their work well also, for although a large volume, it opens readily at any point and remains open—a very essential point in a heavy volume. The printing is excellent, the different types used being all clear cut.

Experimental Pharmacology. A Laboratory Guide for the Study of the Physiological Action of Drugs. By Charles Wilson Green, Ph. D., Professor of Physiology and Pharmacology, University of Missouri. Third edition, revised, with 37 new illustrations. Price $1.00. (*Philadelphia: P. Blakiston's Son & Co., 1909.*)

The book is divided into two parts, "The Action of Drugs" and "Operations, Apparatus and Special Methods." The instructions are clearly given, and with this work to guide him any competent student under careful supervision can readily obtain a secure fundamental knowledge of the action of a number of the most important drugs.

Third Report of the Welcome Research Laboratories, at the Gordon Memorial College, Khartoum. (*London: Baillière, Tindall & Cox, 1908.*)

The variety of subjects treated in this volume makes it one of exceptional interest. The report is a most handsome one, richly and beautifully illustrated, making it a splendid model for others to copy. It is impossible to more than enumerate briefly a few of the papers to show the general scope of work undertaken under the guidance of Dr. Arthur Balfour, the director, who is to be congratulated on the studies presented by himself and staff. There are papers on Trypanosomiasis, Hæmogregarines, Piroplasmosis and Spirochætosis, by the director, and reports by others on Sleeping Sickness, Kala-Azar, Poisonous Snakes, Mosquitoes, Helminthes, Medical Practices and entomological and ethnographical questions, etc. The report is most valuable as a contribution to the knowledge of tropical diseases.

The Ophthalmic Year Book, Vol. VI. Containing a Digest of the Literature of Ophthalmology, with Index of Publications for the Year 1908. By Edward Jackson, M. D., George C. de Schweinitz, M. D., and Theodore B. Schneideman, M. D. Illustrated. (*Denver: The Herrick Book & Stationery Company, 1909.*)

Under the able editorship of these three well-known oculists, the Year Book is a valuable work of reference to all devoted to the diseases of the eye, and to others who are anxious to study the literature on the relationship of eye troubles to general diseases. The work is well compiled, and the different affections of the eye so arranged that it is easy to make use of the volume when searching for special topics.

Retinitis Pigmentosa. By William T. Shoemaker, M. D. (*Philadelphia: J. B. Lippincott Company, 1909.*)

This is a very excellent monograph on the subject of Retinitis Pigmentosa, and it has been so regarded by a number of competent reviewers since it was awarded the Alvarenga Prize of the College of Physicians of Philadelphia in 1908.

The author has made a very careful study of the literature bearing on this subject and in connection therewith has carefully analyzed the findings in seventeen cases occurring in two "deaf and dumb" institutions. In addition to studying the ophthalmological changes in the eyes, the author has carefully considered the visual fields, the refraction of the eyes, the order of birth of the children (a unique table from which we derive the conclusions that these patients are just as apt to be among the first born as last born) and the physical condition of the patients.

We consider the facts very definitely found out in regard to

the urine and blood showing no changes and that there are in very many cases no scotomata as valuable contributions to our more complete knowledge of this subject.

In fact, almost any point which the reader might wish to find out regarding retinitis pigmentosa will be found covered satisfactorily and definitely in this book, and furthermore, it is written in a very pleasing and attractive style.

B. B. BROWNE, JR.

A Text-Book of the Diseases of the Ear. By PROF. DR. ADAM POLITZER. *Translated and edited by* MILTON J. BALLIN, Ph. B., M. D. and CLARENCE L. HELLER, M. D. Fifth edition, revised and enlarged. (*Philadelphia: Lea & Febiger, 1909.*)

Politzer's book on the "Diseases of the Ear" has been before the public a number of years and has always been endorsed in the highest terms by those interested in the study of otology. Certainly no book on the ear deserves warmer praise than this present edition, the fifth. Everything in regard to the hearing organ is thoroughly covered and we can find no omissions, be they of large or small importance. The editors have wisely substituted paragraphs concerning the requirements for enlistments in the army and navy of the United States and Great Britain for similar paragraphs in the German edition regarding the requirements for the army and navy of Austria and Germany, and in every way the book is adapted to the needs of the American student.

An attractive feature, especially for the more advanced worker, is the very generous reference to the work of others in the field of otology, so that one has not only Politzer's views, which are unusually sound and conservative, but also learns how the same points may be regarded by others, and Politzer discusses or quotes their work with fairness and fullness, so that one rarely feels the need of personally looking up the references for detailed information.

Altogether this book contains a mine of information about otology which is both accurate and authoritative, and we hereby recommend it to anyone who desires to read up on any particular point about the ear. We wish to single out for especial commendation the chapter on the Anatomy and Physiology of the Sound-Perceiving Apparatus. Many authors of books on the ear refer the reader to his Anatomy and Physiology for knowledge of this subject, but unfortunately the anatomies and physiologies do not discuss the questions from the otologist's standpoint. Politzer, however, has written a splendid chapter, displaying not only an accurate knowledge of this subject, but a wide acquaintance with the recent literature, which he has thoroughly sifted and digested, and presents in an interesting manner to the reader. We would certainly wish to put Politzer's "Diseases of the Ear" (fifth edition) on any shelf of modern medical classics.

B. B. BROWNE, JR.

Practical Physiological Chemistry. A book designed for use in courses in practical physiological chemistry in schools of medicine and of science. By PHILIP B. HAWK, M. S., Ph. D., Professor of Physiological Chemistry in the University of Illinois. Second edition, revised and enlarged. (*Philadelphia: P. Blakiston's Sons & Co., 1909.*)

The appearance of the second edition of this work of Dr. Hawk so soon after the original edition shows that it has been appreciated, and, it would seem, the recognition is deserved.

As the title indicates, the contents of the volume relate especially to physiological chemistry, the pathological aspects being left practically untouched. The methods given are the newest, and the attempt has evidently been made to bring the present edition up to date. A new chapter on Enzymes and their Action has been added. While the clinical side is largely disregarded, there is much in the volume, usually omitted from the books on clinical diagnosis, that may be found useful to the laboratory worker in medicine. It is not, however, a book to be recommended to physicians generally, as it is "designed for use in courses in practical physiological chemistry . . . . "

Diseases of the Spinal Cord. By R. T. WILLIAMSON, M. D., F. R. C. P. Pp. XI, 432. (*London: Henry Frowde and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

This work is based on lectures which have been given at the Manchester Medical School, to which some additions have been made. The author points out that the work is not intended to be exhaustive, but to serve as an introduction to the subject and as a text-book. The work opens with sections on the structure of the spinal cord, the pathological histology and the functions. Following this is a chapter on the diagnosis and localization of diseases of the spinal cord, which is excellent and easily understood. Following this the various diseases are taken up, being divided into four main groups: (1) Diseases causing symptoms of a transverse lesion of the cord; (2) diseases causing atrophic paralysis; (3) diseases causing spastic paralysis; and (4) diseases in which ataxia is a prominent symptom. Following this is a section on the lesions due to inflammatory conditions, tuberculosis and syphilis. An appendix gives the chief methods of pathological examination of the cord. Altogether the work is to be commended, particularly for its clearness and definite teaching. It should be especially useful for the general practitioner and medical students.

Illustrations of the Gross Morbid Anatomy of the Brain in the Insane. A Selection of Seventy-five Plates Showing the Pathological Conditions Found in Post-Mortem Examinations of the Brain in Mental Diseases. By I. W. BLACKBURN, M. D., Pathologist to the Government Hospital for the Insane, Washington, D. C. (*Washington: Government Printing Office, 1908.*)

The Department of the Interior has just published this valuable volume. The illustrations are beautifully reproduced and opposite each one is the descriptive autopsy note. To neurologists, pathologists and others this work will be most important, for the seventy-five illustrations embody all the commoner affections of the brain; and the photographs from which the reproductions are made, were so perfectly taken that one can learn almost as much from them as from the brain itself. Such a publication is a credit to our government.

Practical Bacteriology, Blood Work and Animal Parasitology. By E. R. STITT, M. D., etc. Price $1.50. (*Philadelphia: P. Blakiston's Sons & Co., 1909.*)

This is a neat, round-cornered, pocket manual, with the faults and virtues incident to extreme compactness. There are included with the text in the 294 octavo pages, "Bacteriological Keys, Zoological Tables and Explanatory Clinical Notes," together with an appendix on diseases of unknown etiology, on the preparation of "normal" solutions, and on general histological technic. At first one is delighted that so much can be interestingly put in such a narrow space, and then one begins to deplore it. The treatment, while crisp and attractive, cannot but be inadequate; while too often the student is brought into acquaintance with phenomena to the disregard of the principles that underlie them. It is a pity that the author's evident talents should have found employment so much in the feat of compression.

This is not to say that the book quite lacks usefulness. The birds-eye view that it gives of parasitology, a subject distressingly complex at first encounter, is of itself worth while—even though some important individual parasites are scarcely noted except for their classification. It is not only refreshing to find the general

principles of immunity expounded plainly within five pages, but as an introduction to more extended reading this may have value. Further, there are distributed throughout the book many most useful technical suggestions. As an accessory laboratory guide it has distinct merits.

Nevertheless, for the undergraduate the trend of the book is a bad one. The didactic, "take six drops of this, add to it seven drops of that, and you will get such and such a reaction," is everywhere evident. One may well doubt the usefulness of a key for the identification of bacteria that differentiates streptococci from pneumococci purely on the basis of form. And to furnish formulæ for serum diagnosis after such a meager introduction to the principles of the subject as is here given seems at least unwise.

The general form of the volume is attractive. In addition to excellent illustrations from Kolle and Wassermann, Williams, Abbott and other sources, there are a number of fairly clear pen-and-ink drawings.

A Text-Book of General Pathology for the Use of Students and Practitioners. By J. Martin Beattie, M. D. (Edin.), etc., and W. E. Carnegie Dickson, M. D. (Edin.), etc. (*Philadelphia: P. Blakiston's Son & Co., 1908.*)

This book, on General Pathology, is well written, compact and well adapted to student use. Many of the illustrations are good, but there are many which convey but little information to the reader. The references are not numerous, and at times too much restricted to the works of English workers. It does not seem to the reviewer that this new book has any great advantages over some of the text-books already in use. The editors in their preface state that the book is based on the teaching of the Edinburgh School, and it is of interest on this account.

Rotunda Practical Midwifery. By E. Hastings Tweedy, M. D., F. R. C. P. I., and G. T. Wrench, M. D. (*London: Henry Frowde and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

In the preface the authors state that this book is not intended as a treatise on midwifery, and, therefore, they have omitted "all that is theoretical and not immediately useful to the practitioner."

The volume is written with the idea of giving in a concise and brief form the practical points in the treatment of obstetrical cases, and is based on the methods employed at the Rotunda Maternity; in fact the book is merely a description of Rotunda methods and in an appendix one finds the statistics of this hospital for several years past.

The book is well arranged, the style is clear, but somewhat brief, the illustrations are for the most part quite diagramatic, but serve their purpose fairly well.

For readers desiring a knowledge of Rotunda methods the book can be recommended, but for others there are several works on obstetrics which would be more useful than this one. F. C. G.

Department of Public Charities, New York City Hospital. Medical and Surgical Report, No. 1, 1909. (*New York: Martin B. Brown Company.*)

This volume is welcome, for it is a marked sign of progress in the administration of the New York City Hospital, where the material for such a report is abundant, and its publication will stimulate the Medical Board, who for years have worked hard against obstructive difficulties. The hospital to-day is in better order than ever before, and the outlook is hopeful that within a comparatively short time, it may be a really creditable institution to a great city. There are 24 papers from 8 departments of the hospital, of, as usual in such reports, varying length and value; some of them illustrated. The editors are to be congratulated on the appearance of this volume, and we trust that the Department of Public Charities will aid them still further in their work, so that the future reports will be still more thorough and complete.

Hydrotherapy. A Brief Summary of the Practical Value of Water in Disease for Students and Practitioners of Medicine. By William H. Dieffenbach, M. D. Price $3.00. (*New York: Rebman Company, 1909.*)

That hydrotherapy will relieve as many conditions as the author believes, seems somewhat doubtful, but anyone interested in the treatment can secure helpful information from this somewhat unnecessarily extended work; not "brief," as stated in the title, since the book contains about 250 pages.

Legal Medicine and Toxicology. By R. L. Emerson, A. B., M. D. (Harvard). (*New York and London: D. Appleton & Co., 1909.*)

As an introduction to the standard works on legal medicine this book will serve as a safe guide. It is a text-book, compiled from the writings of others and lacks any marked distinction.

Seven Hundred Surgical Suggestions. Practical Brevities in Diagnosis and Treatment. By Walter M. Brickner, B. S., M. D., etc., Eli Moschcowitz, A. B., M. D., etc., and [illegible] M. Hays, M. A., M. D. Third series. Price $1 [illegible] *York: Surgery Publishing Company, 1909.*)

These "Suggestions" might serve some students as a form of quiz compend in differential diagnosis, but it is not clear that they would be of any real help to anyone else, and even for students they cannot be recommended. If doctors depend on such "Suggestions" for knowledge of surgery, they are more apt to be wrong than right in their diagnoses. The medical profession is not aided by such a trifling work.

The J. B. Lippincott Company have lately published some "Clinical Diagrams, Designed for the Graphic Representation of Clinical Phenomena for Preservation with the Notes of Cases," by James C. Wilson, M. D. There are other similar diagrams on the market, but these are as good as any of them. They are arranged in perforated sheets of six diagrams on each—¾ front and back views of the body—(male and female) and two side views (male). The use of these diagrams would be greater if the back side of these plates was gummed, so that they could easily be attached to the notes. The price of these diagrams is fifty cents for 25 sheets.

The Blood in Health and Disease. By R. J. M. Buchanan, M. D., F. R. C. P. 8vo. pp. xvi-318. 31 figs. XX plates. (*London: Henry Frowde and Hodder & Stoughton, 1909.*) Price, $4.50.

This volume of the Oxford Medical Publications is intended as a guide to students and practitioners in clinical hematology. The press work and plates are excellent, the former being marked by a few rather glaring typographic errors. The plates are drawn by the author and unusually well reproduced in color.

The first five chapters are devoted to a general description of the blood and a detailed account of technical methods for the determination of the number of cells, hemaglobin concentration, coagulability, viscosity, calcium content, fixation—standing and momentary. The defect of this section is one common to most works on hematology for the student; *i. e.*, the lack of critical discrimination between methods or discussion of their accuracy.

Chapters VI and VII on the morphology of erythrocytes and leucocytes, respectively, are very well done and clearly illustrated by the colored plates. There is the usual nebulous discussion of polychromasia, basophilia and the nuclear problem with regard to the red cells. While the chapter on leucocytes contains some remarkable hypotheses in regard to their flagellation and fer-

tilization, Chapter VIII on the origin of leucocytes is a fair presentation in a condensed form of this still unsettled question.

The remaining four chapters take up the various changes in the blood in disease (except the parasitic diseases of the blood) and present a generally satisfactory objective description of these changes, together with a résumé of the clinical picture and course and some suggestions as to treatment.

A good index concludes the volume. It is on the whole a fairly good elementary reference work on hematology.

THOS. R. BOGGS.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles on Treatment, Medicine, Surgery, Neurology, Pædiatrics, Obstetrics, Gynecology, Orthopædics, Pathology, Dermatology, Ophthalmology, Otology, Phinology, Laryngology, Hygiene, and Other Topics of Interest to Students and Practitioners. Edited by W. T. LONGCOPE, M. D., Philadelphia, with the collaboration of WM. OSLER, JOHN H. MUSSER and others. Vol. III. Nineteenth Series. 1909. (*Philadelphia and London: J. B. Lippincott Company, 1909.*)

There are several papers in this volume worthy of special mention. Among them are "Exotic Dysenteries" by Dr. Paul G. Woolley, late of Siam, but now of Cincinnati University; "A Study on the Pathology and Surgical Treatment of Bilocular Stomach," by Charles Greene Cumston, of Boston; "Women in Medicine," by Dr. James J. Walsh, of New York, and "The Radiographic Examination of the Gastro-intestinal Tract from a Practical Standpoint, Especially in Connection with the Diagnosis and Treatment of Gastro-Enteroptosis," by Dr. Henry K. Pancoast, of Philadelphia.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by HOBART A. HARE, M. D., *and* H. R. M. LANDIS, M. D. Vol. III. September, 1909. Diseases of the Thorax and Viscera, including Heart, Lungs and Bloodvessels, Dermatology and Syphilis, Obstetrics, Diseases of the Nervous System. (*Philadelphia and New York: Lea & Febiger, 1909.*)

The contributors to the present volume of "Progressive Medicine" are Drs. Edward P. Davis, William Ewart, William S. Gottheil and William G. Spiller. The first article contains a valuable résumé of our latest knowledge of tuberculosis. As long as such careful reviews are accessible one is less unhappy because the United States has no publication devoted wholly to the scientific study of tuberculosis. There is also much interesting and new matter connected with diseases of the heart and lungs. Under the topic, "Intermittent Claudication" a plea is made for persevering treatment of it by internal remedies, hot baths and electricity.

Under "Dermatology and Obstetrics" there is an interesting résumé of a paper entitled "Comparative Dermatology," which gives a somewhat full review of the diseases of the skin prevalent among the domestic and other animals. The author, under the heading, "Syphilis," quotes with approval the statement that the disease is found recorded in Europe and Asia from the earliest historical times. A plea is made for the systematic treatment of syphilis in all large centers of population. The author believes that a single hospital with 50 beds is wholly inadequate for the proper treatment of syphilis in London and that a hospital with 60 beds is equally inadequate for a population of 4,000,000 people in New York. Full particulars are also given of the Wasserman Test. The longest paper is that on obstetrics and the briefest is upon diseases of the nervous system. All the contributions are valuable and the selection of topics is discriminating.

Neurasthenia. By GILBERT BALLET, Professeur agrégé à la Faculté de Médicin de Paris. Translated from the third French edition by P. CAMPBELL SMITH, M. D. Illustrated by seven figures. (*Published by Paul B. Hoeber, 69 East 59th Street, New York, 1909.*) Price, $2.00 net.

This is an extremely satisfactory book and should go into the hands of every medical man who has to do with neurasthenic patients either in public hospitals or private practice. The author believes neurasthenia to be a somatic disease of the nervous system in contrast with hysteria which he regards a psychical disease. He does not think that the condition was first described by Beard, but mentions Galen, Stoll, Sydenham and Robert Whytt as preceding him. He might also have added the name of Van Deusen in America as preceding him by several years. He believes that universally nervous exhaustion is due primarily to bad heredity and faulty methods of education which are accentuated by excessive intellectual work, over-pressure in schools, moral over-pressure with depressing emotional strain, the artificial and unsatisfying existence known as "society life," muscular over-pressure, various auto-intoxications, organic disease, frights and traumatisms, and finally digestive, genital and utero-ovarian disorders. The chapters which follow, entitled, "Leading Symptoms" and "Secondary Symptoms," are full and illuminating, but unfortunately too much in detail to be summarized without doing injustice to the book. He gathers the myriad forms of neurasthenia into four groups: 1. Cerebro-spinal neurasthenia, including irritable spine and railway spine; 2. Neurasthenia of women; 3. Genital neurasthenia; 4. Traumatic neurasthenia; the latter being regarded as a true neurasthenia and not as a form of hysteria. His chapter entitled "Need of an Exact Diagnosis," gives a very clear view of the distinction which ought to be drawn, and frequently is not drawn, between those who suffer from neurasthenia, on the one hand, and those on the other who have obsessions, doubts and phobias, or who have melancholic depression or hypochondriacal fancies and are something more than neurasthenics.

In the chapter on "Etiology" he discusses the theories of its gastric origin; *e. g.*, by auto-intoxication, vitiation of nutrition through dyspeptic states and ptosis of the abdominal viscera and finds them insufficient to account for neurasthenia. He regards them rather as symptoms, important symptoms, which may contribute largely to keeping up a neuropathic state. He has the same feeling about utero-ovarian affections, sexual excesses and the like, as competent to produce neurasthenia, and regards them as symptoms rather than causes. He also dismisses the vasomotor theory of Anjil and finally states that the real trouble is in the cells of the cerebral cortex. Of course this is pure theory and is only of value from its bearing upon the treatment of the disorder. The chapters on "Prophylaxis" are excellent and should be read by all who are consulted in the education and training of children.

The section of the work which deals with treatment is probably the most valuable portion of the book. The author believes in psychotherapy and mental suggestion in the waking state, but he does not recommend hypnotic suggestion. He has great faith in diet and gives many directions as to food and general regimen. He also discusses hydrotherapeutics and climatic treatment.

Dictionary of Ophthalmic Terms with Supplement. By EDWARD MAGENNIS, M. D., D. P. H. (*Bristol: John Wright & Sons, Ltd. London: Simpkin, Marshall, Hamilton, Kent & Co.*)

This little book of 67 pages will be mainly useful to medical students who will find in it many words which have not yet found their way into the older medical dictionaries. It is carefully compiled and will be helpful.

The Sexual Disabilities of Man and Their Treatment. By Arthur Cooper, Consulting Surgeon to the Westminster General Dispensary. (*New York: Paul Hoeber, 69 E. 59th Street, 1909.*) Price, $1.00 net.

This is a sensible, judicious book on sterility and impotence in the male and can be commended to the general medical practitioner. If its instructions were faithfully followed we should meet with fewer sexual hypochondriacs.

Mind and its Disorders. A Text-book for Students and Practitioners. By W. H. B. Stoddart, M. D., F. R. C. P., Assistant Physician to Bethlehem Royal Hospital. (*Philadelphia: P. Blakiston's Son & Co., 1909.*)

The condensed comprehensiveness of this work is indicated by the fact that within 481 pages are compressed a 100-page discussion of normal psychology, one half as long on the psychology of the insane, 300 pages of clinical psychiatry, followed by chapters on the legal relations of the insane, and the histologic examination of the nervous system, including cytodiagnosis. For a brief work this is an ambitious survey. The book seems calculated primarily to meet the needs of the student beginning the study of psychiatry, and in this object it may be said to be successful, although exposed, in common with all short treatises, to dangerous tendencies toward dogmatism. The clinical descriptions are for the most part good, but necessarily very much condensed. The subject is handled essentially from the symptomatologic view-point, and the method of grouping reflects the Kraepelinian classification. There are many excellent observations concerning general and special treatment of patients, and other questions of attitude and care which are likely to arise in the routine of hospital work. The book is supplied with numerous illustrations.

F.

Dietetics for Nurses. By Julius Friedenwald, M. D., Professor of Diseases of the Stomach in the College of Physicians and Surgeons, Baltimore; and John Rühraн, M. D., Professor of Diseases of Children in the College of Physicians and Surgeons, Baltimore. Second revised edition. (*Philadelphia and London: W. B. Saunders Company, 1909.*) $1.50 net.

A notice of the first edition of this excellent work appeared in the Bulletin for May, 1905. The issue of a second edition has permitted the presentation of practically a new portion on milk and the addition of a chapter on food preservation and adulterations. The various methods for detecting the latter are valuable and timely at present in view of the awakening of public interest in pure food.

Medical Sociology. A Series of Observations Touching upon the Sociology of Health and the Relations of Medicine to Society. By James Peter Wabasse, M. D., Surgeon to the German Hospital, etc. (*New York and London: D. Appleton & Co., Publishers, 1909.*)

This volume contains essays designed both for the layman and the physician. The former relate to such topics as recently have commanded the attention of the non-medical public as "The Social Evil," "The Alcohol Question," "Christian Science," "Exercise and Health," etc. The latter relate more to medical science, education or art. They are well worth reading, although neither profound nor striking in matter or style. Some of them are very short, containing only a few sentences. Sometimes, as in the essay entitled "College Preparation for the Study of Medicine," there seems a confusion of thought and a special pleading for the non-college educated man. He says: "When the college gives a training that is more practical and helpful and less devoted to the things of minor importance, when it has freed itself of the ancient traditions of culture than may be required to have enjoyed its benefits before being allowed to take up medicine. The medical school that requires the bachelor's degree for admission excludes many of the positively objectionable men, but it also shuts out the one who occasionally comes along who would rise above all the rest and who could be of the greatest service to medicine and to humanity." How does the author know this to be true? How also does he know that to be destitute of a college degree necessarily confers such remarkable powers upon a young man?

Treatment of the Diseases of Children. By Charles Gilmore Kerley, M. D., Professor of Diseases of Children, New York Polyclinic Medical School and Hospital, etc. Second revised edition. Octavo of 629 pages, illustrated. (*Philadelphia and London: W. B. Saunders Company, 1909.*) $5.00 net.

This second edition of Dr. Kerley's book is fully up to the expectation of those familiar with the first edition.

As stated in the preface it is intended for the general practitioner and there is no more useful book on the subject in the language for the purpose.

Written almost entirely from a large and varied personal experience, practical usefulness is its keynote throughout.

Such subjects as clothing, bathing, airing, exercise, sleep, etc., are considered in the detail their great importance demands.

Instructions as to feeding the normal, the delicate and the sick child are simple, practical, and in accord with the best teaching.

It is interesting, however, to note the very definite position assumed as to butter-milk feeding, as frequently practiced to-day, and the calorimetric standard feeding, considerably in use since its introduction by Heubner several years ago. He considers both unnecessary and the former generally harmful. This position is rather at variance with many observers. While it may be certainly agreed that sweet milk adapted to the child's digestion is better and while the remarkable results in atrophic and diarrhœal conditions reported by some overly enthusiastic can scarcely be often expected, there are certain infants who cannot digest ordinary cow's milk, however modified, but who seem able to digest and assimilate properly prepared butter-milk. For such infants it would seem the best substitute, whether its value depends upon living lactic acid bacilli, a changed proteid, a low fat or the three combined.

Of interest, too, is the author's view of the uselessness of subcutaneous injection of salt solution in infant practice. The reviewer's experience entirely coincides wth Dr. Kerley's, not recalling a single instance where definite benefit could be traced to this procedure.

The volume contains a chapter on vaccine therapy and a very useful one on gymnastic therapeutics. It is conservative throughout, and can be fully recommended for the purpose for which it is intended.

R. A. U.

Studies on Immunity. By Robert Muir, M. A., M. D., etc., in collaboration with Carl H. Browning, M. D., Alexander R. Ferguson, M. D., and William B. M. Martin, M. B. (*London: Henry Frowde and Hodder & Stoughton, 1909.*) Price $3.00. Oxford Medical Publications.

In this interesting book the author has brought together and edited a series of papers previously published in various journals, the work having been done in collaboration with others as stated in the title.

The scope of the book is restricted, but such subjects as are introduced are treated in a very thorough manner. Under Part I the properties of hemolytic sera are discussed. Taken up in order are the properties of immune bodies, of complements and their modifications, of anti-immune bodies, and the hemolytic receptors of red corpuscles. Part II deals with the properties of an anti-

serum to a serum and with deviation of complement and its relation to the precipitin test. Part III consists of a section on opsonic action and one on the bactericidal action of normal serum.

The author has been very successful in bringing together a series of separate papers in such a way as to present continuity and logical sequence.

For all of the conclusions drawn illustrative experiments are given with sufficient detail to be easily intelligible without being tedious.

Reference to the literature is constantly made as most of the problems dealt with are ones which have been the object of a great deal of investigation, but a complete bibliography is not attempted.

Extensive and careful experimental work has been carried out by the author and his collaborators on such problems as the absorption of multiple minimum hemolytic doses of serum by corpuscles, the dissociation of immune-body from red blood cells, the inability of antigen saturated with immune-body to produce immune-bodies when injected into animals, fate of the immune-body after hemolysis, etc.

The author leans towards Bordet's conception of the immune-body as a "substance sensibilisatrice" and thinks that complement may unite directly with cell receptors. On the other hand he shares Ehrlich's views on the multiplicity of complements, although he does not carry the division as far as Ehrlich does. He reports the observation of a form of agglutination which is dependent on the presence of two substances, immune-body and complement. The thermo-labile opsonin of normal serum is considered as belonging to the group of complements, immune opsonin having properties which differentiate it quite sharply from normal opsonin.

The author brings forward very good evidence which calls into question much of the work which has been done to establish the existence of anti-complements.

The book is full of interest to students of immunity.

W. L. Moss.

A Practical Treatise on Diseases of the Skin for the Use of Students and Practitioners. By JAMES NEVINS HYDE, A. M., M. D., etc. Eighth and revised edition. Illustrated. (*Philadelphia and New York: Lea & Febiger, 1909.*)

There is no doubt that this edition will be welcomed, for Dr. Hyde has added 250 pages to the preceding one, and his treatise is now the most thorough one in English, as well as most excellent. It is abundantly supplied with illustrations, which are on the whole good, but the coloration of some of the plates is too brilliant to be quite natural. The photographic illustrations are first rate. Dr. Hyde is a master of his subject so that it is unnecessary to praise this work further. All students of medicine will find their difficulties in diagnosticating skin affections lightened by a careful study of this work.

Atlas of the External Diseases of the Eye, Including a Brief Treatise on the Pathology and Treatment. By PROF. DR. O. HAAB. Authorized Translation from the German. Third edition, revised. Edited by G. E. DE SCHWEINITZ, M. D., etc. Illustrated. (*Philadelphia and London: W. B. Saunders Company, 1909.*)

Although one is apt to expect a text-book bearing the names of Prof. Haab and Dr. de Schweinitz to be a good one, the present volume does not do credit to either. In looking over a book of this character one must examine into its merits as an atlas and secondly consider the merits of the subject-matter. In regard to the colored plates many of them are good, but it is very apparent that in many instances the author has gone out of his way to produce extraordinary pictures of ordinary conditions and so mislead the reader. We should wish the plates 22 and 46 to be toned down very considerably. The author seems to have forgotten the fact that his text-book is presumably intended for medical students of some sense, otherwise he would not have countenanced the insertion of at least two extravagant pictures which one would only expect to find in medical museums of a certain type, appealing to the curiosity of the public (see Table 46 (Exophthalmic Goitre and 22 (Eczema of Cornea and Mouth). How Dr. de Schweinitz allowed his name to be attached to any book in which such pictures were allowed to appear is more than the reviewer can understand. Pictures such as these two are offensive, certainly not instructive, and any text-book containing them should hardly be allowed a place amongst first-class medical books. Some of the pictures are such poor representations of the conditions which they are supposed to exhibit that it would have been wiser to have omitted them *vide* Plates 21, 23, 24b, 5a, 14a, 20, 22, 44 and 45. Plates 1 and 2 represent very extreme and rather unusual types of a very common affection, not otherwise represented. The beginner in ophthalmology will have to see a great many eye patients before he will find cases to correspond to many in this book, and that is what we wish to censure in this book. Colored pictures are only of value to the one who does not know, and we think the beginner is not given a clear mental picture when so many unusual types, which probably may make more striking pictures, are presented.

Had the book been entitled "Atlas of Atypical Cases of Common Ocular Affections," it would not have been inappropriately named.

Regarding the text of this book we may say that the author's ideas have not always been translated into the very best English, nor has a logical sequence of ideas always been maintained, nor a due sense of the relative importance of subject-matter been considered by the author. The fact that the observing physician should have good eyesight is almost an axiom and we consider the paragraphs devoted to this subject useless, especially in such a short text-book where space should be at a premium. In other places, also, we find considerable space devoted to the uncommon, while more important facts are omitted. And we call especial attention to this fact, for we assume that this book is intended for those whose knowledge of eye diseases is not large. While this book may please at first sight we feel sure that close inspection will convince most teachers that it will not serve as a very valuable adjunct to the clinic in the teaching of ophthalmology to medical students.

B. B. BROWNE, JR.

Parenthood and Race Culture. An Outline of Eugenics. By CALEB WILLIAMS SALEEBY, M. D., etc. (*New York: Moffat, Yard & Co., 1909.*) Price, $2.50.

It was Francis Galton who first used the term eugenics, and founded a society in England for the study of this science, as it may be called, and the methods to be pursued in the higher development of man; for race culture is a brief definition of eugenics. Dr. Saleeby's outline will be read with attention by many who are interested in this vital social problem,

The question of race culture is one of the most important that confronts all peoples to-day—the effects of alcoholism, syphilis, lead-poisoning, etc., on the present and future generations are matters that are coming to the fore more and more, and under another term than eugenics have already received much attention from students of social problems. These diseases must be controlled in some way before there will be any marked advance in our civilization, and it is these and other points concerning eugenics, which are dealt with in this book.

It is a great pity, however, that the author has not shown more moderation in his enthusiasm for this religion of the fu-

ture. He shows little or no patience with politicians and others who hold different views from himself, and the book is marred by a long and most unseemly attack on the London County Council, which is entirely out of place in a work meant for general reading. In fact, throughout the work the self-conceit of the author is too much in evidence, and he will, by his ill-placed insults make, it is to be feared, more enemies than adherents to his cause. Many of us are mentally astigmatic, but that is no reason why Dr. Saleeby should condemn us all as fools, and worse if we do not see as straight as he does. He has all the faults in his writing of an ardent enthusiast; but a clear outline of eugenics from him, tempered and well arranged, would be a most welcome social service hand-book.

A new subject, as this is, deserves to be most carefully brought before the public to attract and hold their attention, and had Dr. Saleeby shown more consideration for the weakness of others, his book would have been warmly received.

A Text-Book of Materia Medica, Pharmacology and Therapeutics. By George F. Butler, M. D., etc. Sixth edition. Thoroughly revised and enlarged. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

The sixth edition of this work is a volume of 708 pages. The first 60 pages are devoted to an introduction and to a consideration of pharmacology and general therapeutics, 104 pages to pharmaceutical preparations, followed by 463 pages in which the actions of drugs are considered under the following classifications:

Drugs whose chief action is on the nervous system; drugs acting chiefly on the circulatory organs; drugs acting chiefly as vasoconstrictors; drugs acting locally on microorganisms (antiseptics); volatile oils, resins, oleoresins and balsams; antipyretics and antipyretic analgesics; restoratives and alteratives; acids, alkalies, salts; drugs acting chiefly on the gastro-intestinal organs; drugs acting on the respiratory mucous membrane; drugs acting particularly on the uterus; drugs acting particularly on the kidneys; diaphoretics; mineral astringents; topical remedies; organotherapy [this is only allotted three pages; adrenalin is not included here, but described elsewhere].

Serum therapy, opsonins, opsonic index and vaccine therapy are considered in eight pages. Twenty-three pages are devoted to prescriptions. An excellent general index and a handy clinical index occupying 58 pages are appended.

From the standpoint of a general practitioner the author has presented a valuable book, one that is rich in suggestions concerning the therapeutic value of drugs as well as numerous warnings and specific directions which will aid in securing the best results in the practical application of these drugs. In this respect the book will also prove itself very valuable to the student of medicine.

From the standpoint of its value to the student, however, it is a matter of regret that in many instances the theories as to the method of action have not received the consideration which their importance demands, for it is exceedingly desirable that the student should acquire accurate conceptions, where possible, as to the exact method of action of these bodies, and where this is impossible, he should at least have a clear understanding of the current theories relating thereto.

The author ascribes more potency to some drugs than recent investigations would seem to warrant, as for instance in the numerous drugs mentioned by him as exerting a cholagogue action. Again he credits others with exerting a beneficial action where such is really not accepted as the case, as for instance in the administration of thyroid extract in Basedow's disease.

The value of the book is somewhat enhanced by a consideration of some of the most familiar and well tested non-official preparations which have proved themselves of sufficient importance. It is rather surprising, however, not to find either phenolphthalein or atoxyl included in this list.

This book is a valuable addition to the library of the practicing physician as a treatise on materia medica and therapeutics, but is far from ideal as a text-book of pharmacology for the use of the student.

L. G. Rowntree.

Modern Medicine. Its Theory and Practice. In Original Contributions by American and Foreign Authors. Edited by William Osler, M. D., Regius Professor of Medicine in Oxford University, England, etc. Assisted by Thomas McCrea, M. D., Associate Professor of Medicine and Clinical Therapeutics in Johns Hopkins University, Baltimore. In seven octavo volumes of about 900 pages each, illustrated. Volume VI, Diseases of the Urinary System, of the Ductless Glands, of the Muscles, Diseases of Obscure Causation, Vasomotor and Trophic Disorders, Medical Aspects of Life Insurance. (Price, $6.00. (*Philadelphia and New York: Lea & Febiger, 1909.*)

The sixth volume of Osler's "Modern Medicine" contains a number of very important sections. Part I—The urinary system with the monographs of John McCrae, Archibald Garrod, James B. Herrick, Thomas R. Brown and Hugh Young. Of these the most noteworthy are McCrae's summary of the present status of the physiology and pathology of renal disease, Herrick's excellent clinical studies of nephritis, and Brown on the various infectious processes in the urinary tract including a very careful study of renal tuberculosis, and Young's discussion of diagnosis by instrumentation is an excellent innovation in the system which fills a long felt want. The chapters on tumors of the kidney and urinary calculi by the same author are particularly good.

Part II, "Diseases of the Ductless Glands," is entirely from the pen of Dr. Dock, whose wide experience and acquaintance with the whole literature of this field make his contributions of the greatest value.

Part III, "Diseases of Obscure Causation," contains a most thorough and interesting discussion of Hodgkins Disease, by Dr. Longcope, whose investigations in this field give his work special worth.

Arthritis deformans is discussed by Thomas McCrae, who has long been identified with the clinical literature of this still very obscure group of diseases.

Chapters on osteomalacia by Dock, and astasia-abasia and adiposis dolorosa, by Daniel McCarthy, conclude the section.

Part IV, "Diseases of the Muscles," contains exhaustive chapters by W. R. Steiner and Daniel McCarthy.

Part V, "Vaso-motor and Trophic Disorders," by Dr. Osler, is in his best vein and covers a field which has been a life-long study with him and in which his personal experience with many of the rarer maladies is unique.

The concluding chapter of this section, by Emerson, covers the rarer diseases of the bones.

Part VI, "Medical Aspects of Life Insurance," by Dr. C. L. Greene, will prove interesting and very practical to the large number of the profession who pass on life risks daily.

Suture of Arteries. An Experimental Research. By E. Archibald Smith, M. B., Ch. B., Victoria University, F. R. C. S., England. (*London: Henry Frowde and Hodder & Stoughton, 1909.*) Oxford Medical Publications.

In this little book the author gives the results of his experiments on animals and describes his method of arterial suture, in which he uses the Quill suture for both lateral and end-to-end approximation. This method seems to be a satisfactory one, but is somewhat more difficult than that commonly used in this country.

In the historical chapter the interesting fact is brought out that arterial suture was suggested by Lambert in England, and first successfully carried out by Hallowell, an English surgeon, on June 15, 1759. He used a short steel pin which he passed through the two lips of the wound in the artery, and secured by twisting a thread round it, as in hare-lip. J. S. D.

A Text-Book of Practical Therapeutics. With especial reference to the application of remedial measures to diseases and their employment upon a rational basis. By HOBART AMORY HARE, M. D., B. Sc., etc. Thirteenth edition. Enlarged, thoroughly revised and largely rewritten. Illustrated. Price, $5.00. (*Philadelphia and New York: Lea & Febiger, 1909.*)

One of the most successful of all text-books, this work requires no note to draw attention to its many excellent qualities, upon which the stamp of success has been marked by the numerous editions. That the last is as much up to date as possible is not to be questioned, for Dr. Hare honestly reedits, not merely reprints earlier issues. It is worth while to state that this Therapeutics has already appeared in a Korean edition, and will soon do so in a Chinese one. This is the best proof of its popularity and of its real value to students and practitioners.

Studies in Paranoia, Periodic Paranoia and the Origin of Paranoid Delusions. By NIKOLAUS GIERLICH, Wiesbaden. Contributions to the Study of Paranoia. By M. FRIEDMANN, Mannheim. Translated and edited by SMITH ELY JELLIFFE, M. D. (*New York: The Journal of Nervous and Mental Disease Publishing Company, 1908.*)

This is the second of the series of monographs planned by the editors, Drs. Jelliffe, of New York, and White, of Washington. Dr. Gierlich, in "Periodic Paranoia and Paranoid Delusions," presents the histories of three cases of paranoia which, in his opinion, justify a more favorable prognosis than has formerly been given in this disease. The first was a high government official, 50 years of age, who, after a fatiguing journey of a month, had sluggish digestion, insomnia, irritability and great restlessness, and within a few days delusions of a distinctly paranoid character. These continued for nine days and suddenly disappeared so that he resumed his public duties and remained perfectly well for nine or ten months when he had a recurrence of his symptoms, but recovered after about four weeks. In 1898 he had a third similar attack from which he also recovered and had no return of mental trouble up to the time of his death in 1900 from cancer of the bladder.

In the second case a male, 35 years of age, and a successful merchant, two years subsequent to an apparently happy marriage, became very jealous of his wife, accused her of attempting to poison him and charged her with adultery. He recovered in a very short time, but had a return of his mental disturbance in the following year and a third in 1899. Since then, although he has had threatenings of trouble, he has escaped any active outbreak and has been able to resume his business and has conducted it with success.

A third case was a single woman, 43 years of age, who, commencing with 1898, developed delusions of a paranoid character, from which she recovered after several months, but had a recurrence in 1899 and 1900, but in each case recovered and in 1901 continued perfectly well.

These three cases are not wholly conclusive as to the curability of paranoia, inasmuch as all three had relapses, and the period during which they remained free from further attacks seems much too short, but they show that cases marked by periodicity are more frequent than was formerly supposed and that periods of absolute freedom from mental disturbance occur. No one, however, could say that any of them had attained a stable degree of mental health. Some of the cases mentioned in the second paper ("Contributions to the Study of Paranoia") are rather more convincing because the period of absolute freedom from morbid ideas is longer and the mental state is more stable.

These studies are of value as showing the advantage of a careful study of each case individually. Those who develop paranoid delusions cannot, in the light of our present knowledge, be relegated to incurability, nor are they necessarily incurable, even if the disease has persisted for several years, since in one of the cases mentioned it lasted for two and one-half years and was followed by recovery.

A Treatise on the Principles and Practice of Medicine. By A. R. EDWARDS, A. M., M. D., etc. Second edition, revised. Illustrated. (*New York and Philadelphia: Lea & Febiger, 1909.*)

This second edition of Dr. Edwards' Treatise shows evidence of re-working of the material and is an improvement on the first edition which was reviewed in these pages.

There is much that is good in the work and it is rather better than many of similar scope. The section on parasitic diseases is rather below the average of the body of the work and the illustrations, many of them, very poor. The color work in the plates is often so inferior as to render them valueless.

T. R. B.

BOOKS RECEIVED.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis, M. D. Vol. III. September, 1909. 8vo. 336 pages. Lea & Febiger, Philadelphia and New York.

A Treatise on the Principles and Practice of Medicine. By Arthur R. Edwards, A. M., M. D. Second and thoroughly revised edition. Illustrated with 100 engravings and 21 plates. 1909. 8vo.. 1257 pages. Lea & Febiger, New York and Philadelphia.

Philadelphia General Hospital Reports. Vol. VII. 1908. Edited by Herman B. Allyn, M. D. 1909. 8vo. 272 pages. Printed by the Dunlap Printing Company, Philadelphia.

Medical Sociology. A Series of Observations Touching upon the Sociology of Health and the Relations of Medicine to Society. By James Peter Warbasse, M. D. 1909. 12mo. 355 pages. D. Appleton & Co., New York and London.

Dictionary of Ophthalmic Terms. With Supplement. By Edward Magennis, M. D., D. P. H. 1909. 32mo. 67 pages. John Wright & Sons, Ltd., Bristol. Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Nineteenth Series. Vol. III. 1909. 8vo. 296 pages. J. B. Lippincott Company, Philadelphia and London.

A Text-Book of Practical Therapeutics. With Especial Reference to the Application of Remedial Measures to Disease and Their Employment upon a Rational Basis. By Hobart Amory Hare, M. D., B. Sc. Thirteenth edition, enlarged, thoroughly revised, and largely re-written. Illustrated with 122 engravings and 4 colored plates. 1909. 8vo. 958 pages. Lea & Febiger, Philadelphia and New York.

Clinical Manual for the Study of Diseases of the Throat. By James Walker Downie, M. B., F. F. P. S. G. Second edition, revised, and in large measure re-written. With 104 illustrations. 1909. 12mo. 432 pages. James Maclehose & Eons, Glasgow.

Organic and Functional Nervous Diseases. A Text-Book of Neurology. By M. Allen Starr, M. D., Ph. D., LL. D., Sc. D. Third edition, thoroughly revised. Illustrated, with 300 engravings in the text and 29 plates in color and monochrome. 1909. 8vo. 911 pages. Lea & Febiger, New York and Philadelphia.

A Text-Book of Surgery. For Students and Practitioners. By George Emerson Brewer, A. M., M. D. Second edition, thoroughly revised and much enlarged. Illustrated with 415 engravings in the text and 14 plates in colors and monochrome. 1909. 8vo. 915 pages. Lea & Febiger, New York and Philadelphia.

A Manual of Otology. By Gorham Bacon, A. B., M. D. With an Introductory Chapter by Clarence John Blake, M. D. Fifth edition, revised and enlarged. With 147 illustrations and 12 plates. 1909. 12mo. 508 pages. Lea & Febiger, New York and Philadelphia.

A Practical Treatise on Diseases of the Skin. By James Nevins Hyde, A. M., M. D. Eighth and revised edition. Illustrated with 223 engravings and 58 plates in colors and monochrome. 1909. 8vo. 1126 pages. Lea & Febiger, Philadelphia and New York.

Surgical Diagnosis. By Edward Martin, M. D. Illustrated with 445 engravings and 18 plates in colors and monochrome. 1909. 8vo. 772 pages. Lea & Febiger, Philadelphia and New York.

A Handbook of Medical Diagnosis. In four parts. 1. Medical Diagnosis in General. II. The Methods and Their Immediate Results. III. Symptoms and Signs. IV. The Clinical Applications. By J. C. Wilson, A. M., M. D. 408 text illustrations and 14 full-page plates. [1909.] 8vo. 1435 pages. J. B. Lippincott Company, Philadelphia and London.

Leucopathies, Métastases, Albuminuries et Ictères Leucopathiques. Par le Dr. Emile Feuillié. 1909. 8vo. 195 pages. G. Steinheil, Paris.

NOTE.

The president of the American Gynecological Society has appointed a committee to report at the next annual meeting in Washington, on the present status of obstetrical teaching in Europe and America, and to recommend improvements in the scope and character of the teaching of obstetrics in America.

The committee consists of the professors of obstetrics in Columbia University, University of Pennsylvania, Harvard, Jefferson Medical College, Johns Hopkins University, Cornell University, and the University of Chicago.

Communications from anyone interested in the subject will be gladly received by the chairman of the committee, Dr. B. C. Hirst, 1821 Spruce street, Philadelphia, Pa.

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